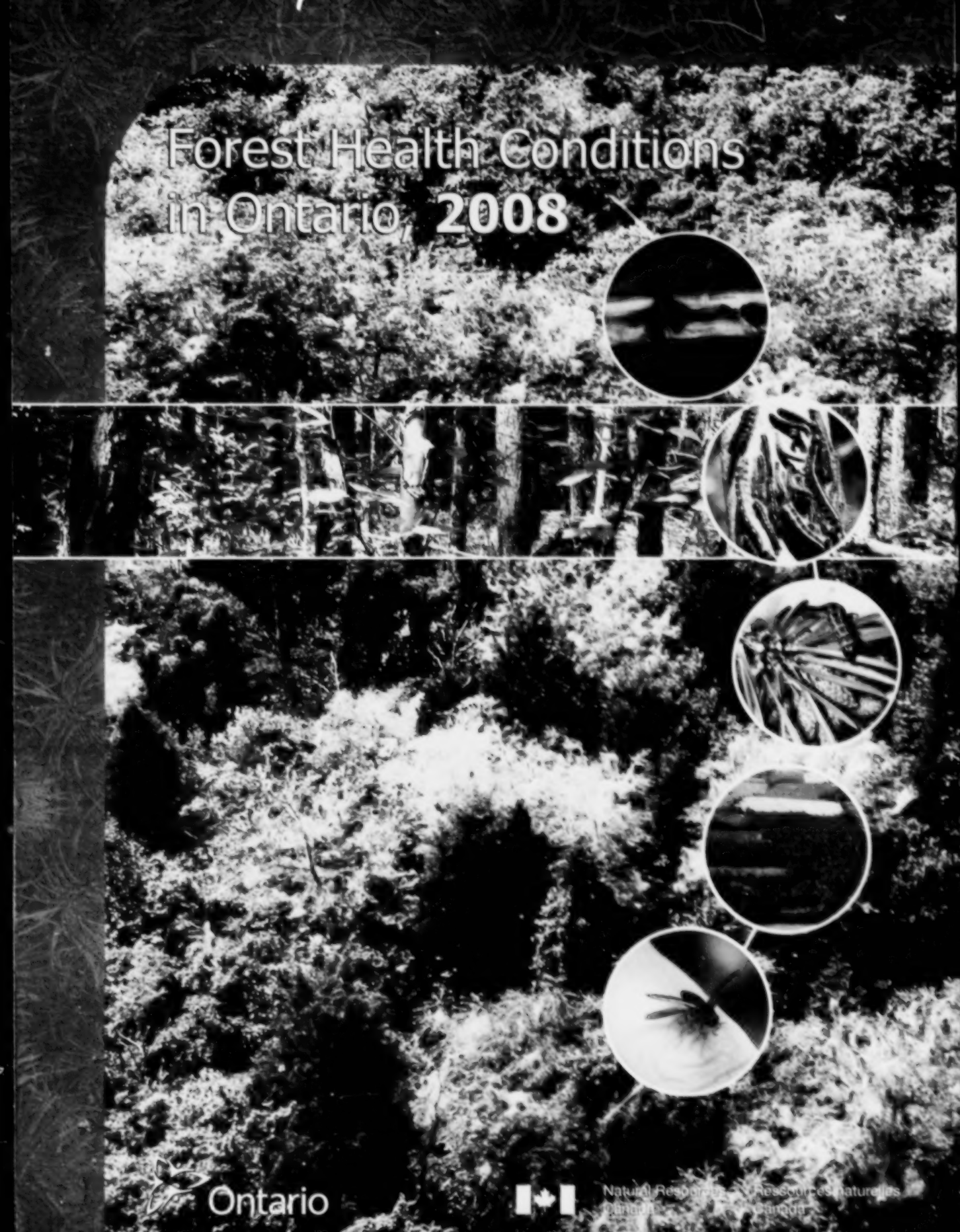
# Forest Health Conditions in Ontario, 2008



Ontario

Natural Resources Canada
Ressources naturelles Canada

# Forest Health Conditions in Ontario, **2008**

**Edited by T. Scarr[1], K. Ryall[2] and L. Thompson[1] (Editors)**

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For more information on forest health in Ontario visit the Ontario Ministry of Natural Resources website: www.ontario.ca/foresthealth

You can also visit the Canadian Forest Service website: www.glfc.cfs.nrcan.gc.ca

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Email: mnr.nric@ontario.ca

52222

**ISSN 1913-6164 (print)**
**ISBN 978-1-4249-8777-1 (2008 ed., print)**

**ISSN 1913-617X (online)**
**ISBN 978-1-4249-8778-8 (2008 ed., pdf)**

*Front cover: Moderate to severe defoliation by fall webworm in Point Pelee National Park (Photo by E. Czerwinski).*

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## ACKNOWLEDGEMENTS

The forest health monitoring program in Ontario is conducted under the Memorandum of Agreement in Forest Health Monitoring between the Ontario Ministry of Natural Resources (OMNR) and the Canadian Forest Service (CFS) of Natural Resources Canada. The annual field program is designed and led by Taylor Scarr[1] and Krista Ryall[2] on behalf of the two organizations. The province is divided into 12 work areas, which are assigned to field technicians from both OMNR and CFS who conduct the field work and assist with research projects.

Field staff conduct aerial surveys, perform ground checks to verify aerial surveys, assess ground plots, trap or monitor insects, collect insect and disease samples, and participate in research and monitoring programs. They also provide extension services to forest managers and landowners, and make presentations on local conditions at various workshops and seminars.

In 2008, the OMNR-CFS field staff were:

Bill Biggs[2] (Sudbury-Parry Sound)
Ed Czerwinski[1] (Peterborough-Bancroft)
Hugh Evans[2] (Midhurst-Aurora)
Mike Francis[1] (Thunder Bay-Nipigon)
Wayne Ingram[1] (Algonquin Park-Pembroke-Kemptville)
Al Keizer[2] (Timmins-Kirkland Lake-North Bay)
Doug Lawrence[2] (Sault Ste. Marie)
Dan Rowlinson[1] (Wawa-Chapleau)
Lincoln Rowlinson[1] (Kenora-Fort Frances
Barry Smith[2] (Dryden-Red Lake-Sioux Lookout)

Since 2005, a special survey has been conducted with support from the Canadian Food Inspection Agency for European wood wasp, *Sirex noctilio*. For 2008, *Sirex noctilio* field collections were done by Pat Hodge[1] and Heather Zurbrigg[1] with screening and sample preparation done by Sarah Drabble[1] and Madeline Alyea[1]. Thanks to Al Foley[1] for the use of the Ontario Tree Seed Plant as a field base. Peter de Groot[2] and Taylor Scarr[1] provided scientific leadership to the *Sirex noctilio* survey, with technical support from Reg Nott[2]. Kathryn Nystrom[2] performed taxonomic identification for *Sirex noctilio* and related species that were collected.

Data management and GIS support was provided by Ron Fournier[2] and Larry Watkins[1]; all forest disturbance maps for this report were compiled by Ron Fournier. Insect identification was provided by Kathryn Nystrom[2] with assistance from Isabelle Ochoa[2]; fungal identification was provided by Chuck Davis[2]. Program pathology and mycology guidance and expertise were provided by Richard Wilson[1]. Program entomology guidance and expertise were provided by Taylor Scarr[1]. In addition to the monitoring results described herein, the forest health program was involved or assisted in several research projects led by Krista Ryall[2], but which are outside the scope of this report. Appreciation is extended to Mike Francis[1] and Ed Czerwinski[1] for help compiling the first draft of this report and for providing many helpful edits.

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# Introduction

**T. Scarr[1], and K. Ryall[2]**

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The Forest Health Conditions in Ontario report is produced annually to provide information on the health of Ontario's forests.

Ontario's Forest Health Monitoring Program in 2008 was jointly conducted by the Canadian Forest Service (CFS) and the Ontario Ministry of Natural Resources (OMNR) under a Memorandum of Agreement. These organizations have worked cooperatively in monitoring forest health in Ontario since 1936. Each agency provides trained staff to monitor and report on forest health issues within 12 forest health work areas covering the province of Ontario (Figure 1.1).

Recording and reporting of forest health conditions in Ontario includes monitoring the occurrence of both native and invasive biotic (e.g., insect, disease), and abiotic (e.g., severe weather conditions) disturbances and events. The monitoring program consists of permanent sample plots, temporary sample plots, plantation surveys, and aerial mapping of major forest disturbances. All forest areas included are: provincial Crown land, federal lands, First Nations territories, parks, and private land and urban areas. Ad hoc sampling of insects and diseases is also done to maintain a database of their occurrence in the province.

Insect, disease and plant samples are collected and sent to the CFS, Great Lakes Forestry Centre for identification of causal agents. Throughout the field season, forest health updates are distributed to client groups including forest industry, government, landowners and other interested stakeholders.

Results of the program are presented at the Annual Forest Health Review. The results of the monitoring program are used to report on the health of Ontario's forests and the major factors affecting forest health. The information is used to develop forest pest management

and forest management policy, for planning pest management programs, and prioritizing and designing research projects. The information is also used to support other initiatives such as criteria and indicators of forest sustainability, biodiversity objectives, invasive species strategies and programs, and climate change programs.

The results of the 2008 monitoring program and the subsequent forest health updates were used to compile the Forest Health Conditions in Ontario 2008 report. This report is divided into chapters on major forest disturbances, invasive species, and disturbances reported in each OMNR administrative region: Northwest Region, Northeast Region and Southern Region (Figure 1.1). Pests reported within each chapter are listed in alphabetical order by scientific name. An index has also been included at the end of the report for easy reference.



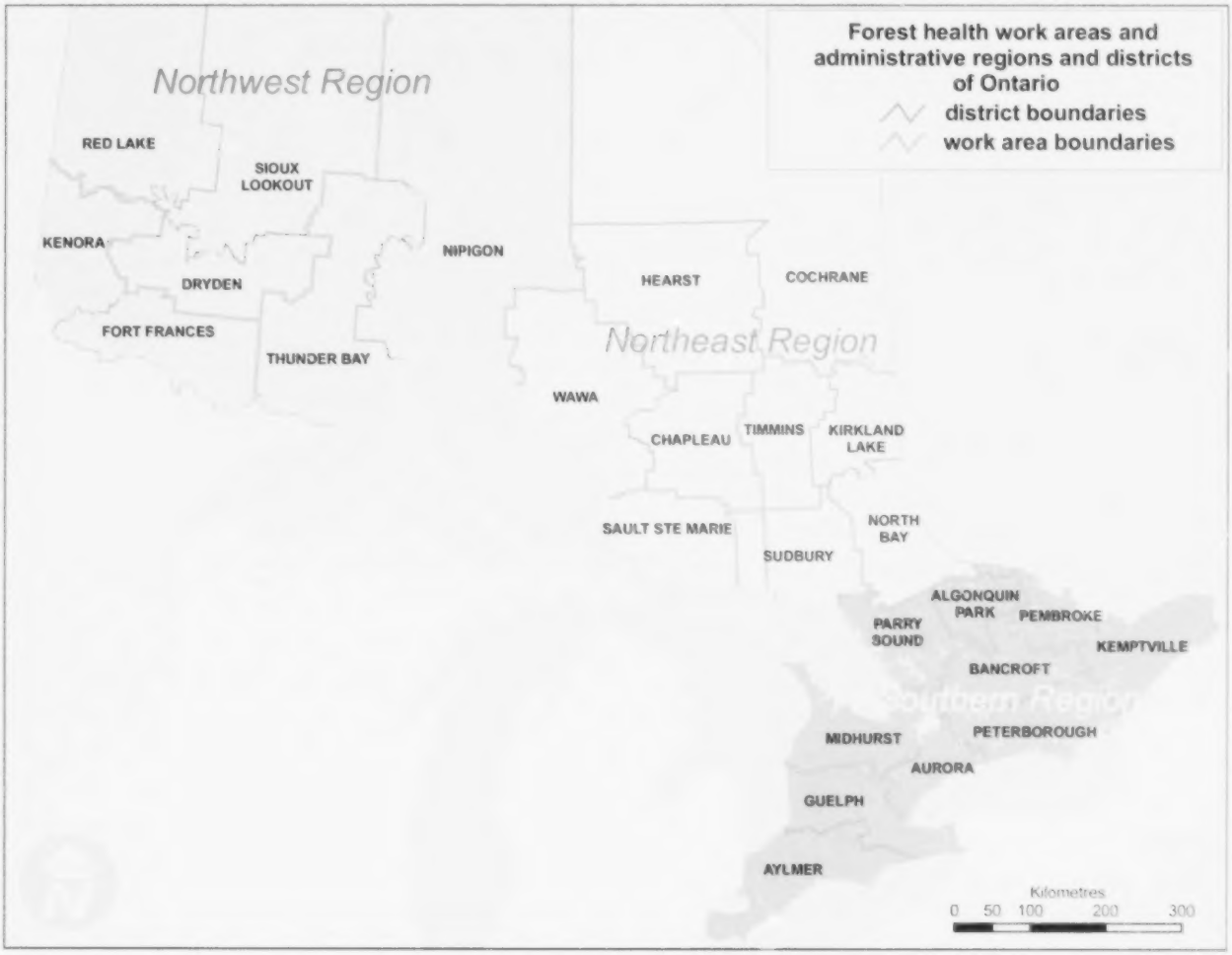


Figure 1.1 Forest health work areas and Ontario Ministry of Natural Resources administrative regions and districts

For the purpose of this report, major forest disturbances are caused by biotic and abiotic factors which lead to severe damage that typically spans more than one region. The term invasive species refers to insects or pathogens that are either accidentally or deliberately introduced to Ontario, or that have expanded beyond their normal range, and are currently causing, or are likely to cause, economic or environmental harm or harm to human health.

A variety of forest health events occurred in Ontario in 2008. The cool, wet summer resulted in increased occurrences of foliar diseases across the province. The area of moderate-to-severe defoliation by gypsy moth continued to increase in 2008. However, the cool, wet weather provided ideal conditions for the growth and spread of the fungal disease *Entomophaga maimaiga*, which killed off many of the gypsy moth larvae.

Invasive species continued to cause problems in several parts of Ontario. Most notable was emerald ash borer, which continued to spread across the province. This pest, originating from Asia, was detected for the first time in northern Ontario in Sault Ste. Marie and was found as far east as Ottawa. Surveying for the invasive European woodwasp recurred this year but no new areas were found infested. Surveys conducted in Toronto and Vaughan by municipal staff or contractors under the direction of the Canadian Food Inspection Agency found no new infestations of Asian long-horned beetle.

Other significant forest health issues in the province included a 50% decrease in overall area defoliated by eastern spruce budworm and a 70% decrease in overall area defoliated by jack pine budworm. Although overall area of jack pine budworm defoliation was reduced from 2007, there was an expansion of moderate-to-severe defoliation in Red Lake and Timmins districts. Overwintering larval surveys were conducted in the fall of 2008 to forecast jack pine budworm defoliation for 2009 to determine the need for a pest management program in 2009.

A survey was completed in 2008 to determine the distribution, range, and condition of butternut, an endangered species.

There are some forest pests not described in this report that may have affected Ontario's forests in 2008 or in previous years. Information on certain pests may be omitted if insignificant populations or damage levels occurred in 2008, or were very small on a spatial scale, or if identification of the pest had not yet been verified.

# Major Forest Disturbances

**M. Francis[1], D.T. Rowlinson[1], L. Rowlinson[1], H.J. Evans[2], and A.J. Keizer[2]**

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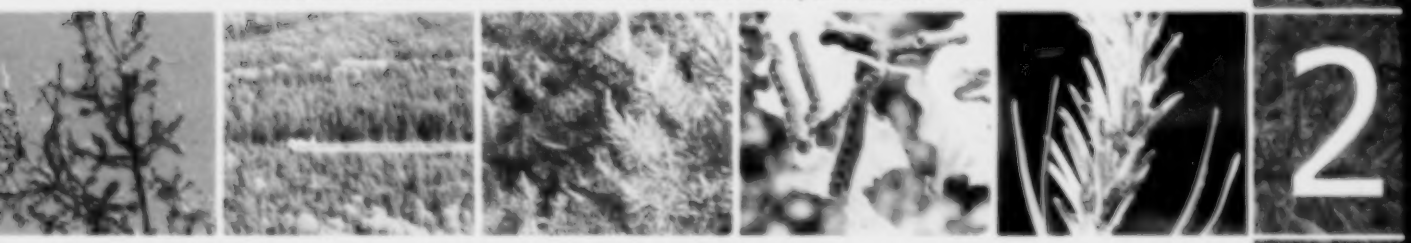
SECTION 2



## FOREST INSECTS

### Large aspen tortrix, *Choristoneura conflictana* (Wlk.)

This leaf-roller and close relative of the spruce budworm (*Choristoneura fumiferana* (Clem.)) is considered to be the second most significant defoliator of trembling aspen (*Populus tremuloides*, Michx.) throughout the natural range of this host species (Figure 2.1).

Aerial surveys across Ontario revealed 64,267 ha of moderate-to-severe defoliation caused by the large aspen tortrix in 2008, a 21% decrease from the 81,947 ha recorded in 2007 (Table 2.1).

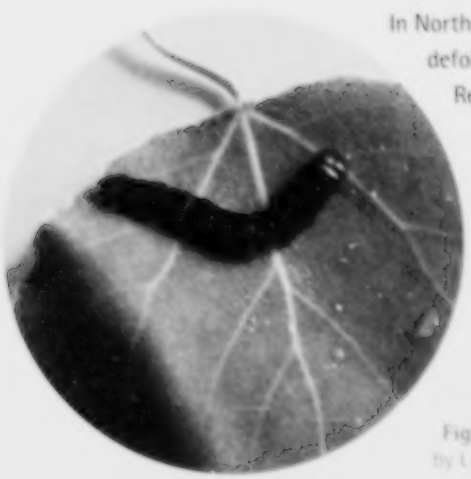


Figure 2.1 – Large aspen tortrix larva on trembling aspen (photo by L. Rowlinson).

In Northwest Region, the overall area of moderate-to-severe defoliation was down by 46% as populations collapsed in Red Lake District. Feeding by this pest on aspen (*Populus* spp.) persisted, though, for the third consecutive year in Kenora District.

A total of 42,586 ha of moderate-to-severe defoliation was mapped in Kenora District in 2008, a slight decrease from the 47,483 ha in 2007 (Figure 2.2). The main area of defoliation in the district was along the Winnipeg River system from the western

Table 2.1 Gross area of moderate-to-severe defoliation caused by large aspen tortrix in Ontario, 2004-2008.

| Region | Area of defoliation (ha) | | | | |
|---|---|---|---|---|---|
| District | 2004 | 2005 | 2006 | 2007 | 2008 |
| **Northwest** | | | | | |
| Kenora | 0 | 0 | 23,681 | 47,483 | 42,586 |
| Red Lake | 0 | 0 | 1,076 | 31,167 | 0 |
| Sub total | 0 | 0 | 24,757 | 78,650 | 42,586 |
| **Northeast** | | | | | |
| North Bay | 0 | 0 | 0 | 0 | 10,606 |
| Sault Ste. Marie | 0 | 0 | 0 | 0 | 11,075 |
| Sudbury | 0 | 0 | 0 | 0 | 0 |
| Timmins | 0 | 0 | 0 | 0 | 0 |
| Sub total | 0 | 0 | 0 | 0 | 21,681 |
| **Southern** | | | | | |
| Bancroft | 3,987 | 3,997 | 0 | 0 | 0 |
| Parry Sound | 256 | 2,364 | 5,937 | 3,297 | 0 |
| Pembroke | 2,338 | 1,412 | 0 | 0 | 0 |
| Sub total | 6,581 | 7,773 | 5,937 | 3,297 | 0 |
| **Provincial total** | **6,581** | **7,773** | **30,694** | **81,947** | **64,267** |

edge of Rat Portage Bay on Lake of the Woods to the western shore of Big Sand Lake. The infestation continued to the northwest through the Islington Indian Reserve to Eaglenest Lake on the Ontario/Manitoba border. The southern boundary of the infestation was mainly along the CN Railway in Rice Township, Kenora District.

New infestations in Northeast Region totalled 21,681 ha of moderate-to-severe defoliation in 2008. In Sault Ste. Marie District, scattered pockets of defoliated aspen were mapped around the community of Searchmont, in and northwest of the city of Sault Ste. Marie, and east to the village of Echo Bay. Moderate-to-severe defoliation totalled 11,075 ha. In North Bay District, 10,606 ha of defoliation were mapped in North Bay and Phelps townships on the northeast end of Lake Nipissing (10,606 ha).

There was no defoliation recorded in the Southern Region by the large aspen tortrix in 2008.

## **Eastern spruce budworm**, *Choristoneura fumiferana* (Clem.)

Eastern spruce budworm is one of the most destructive insects in Ontario's forest. The main host trees of this species are balsam fir (*Abies balsamea* L.), white spruce (*Picea glauca* Monech Voss.), and black spruce (*P. mariana* Mill. BSP).

The spruce budworm outbreak which has persisted for several years in north eastern and southern Ontario declined considerably in 2008. The area of moderate-to-severe defoliation

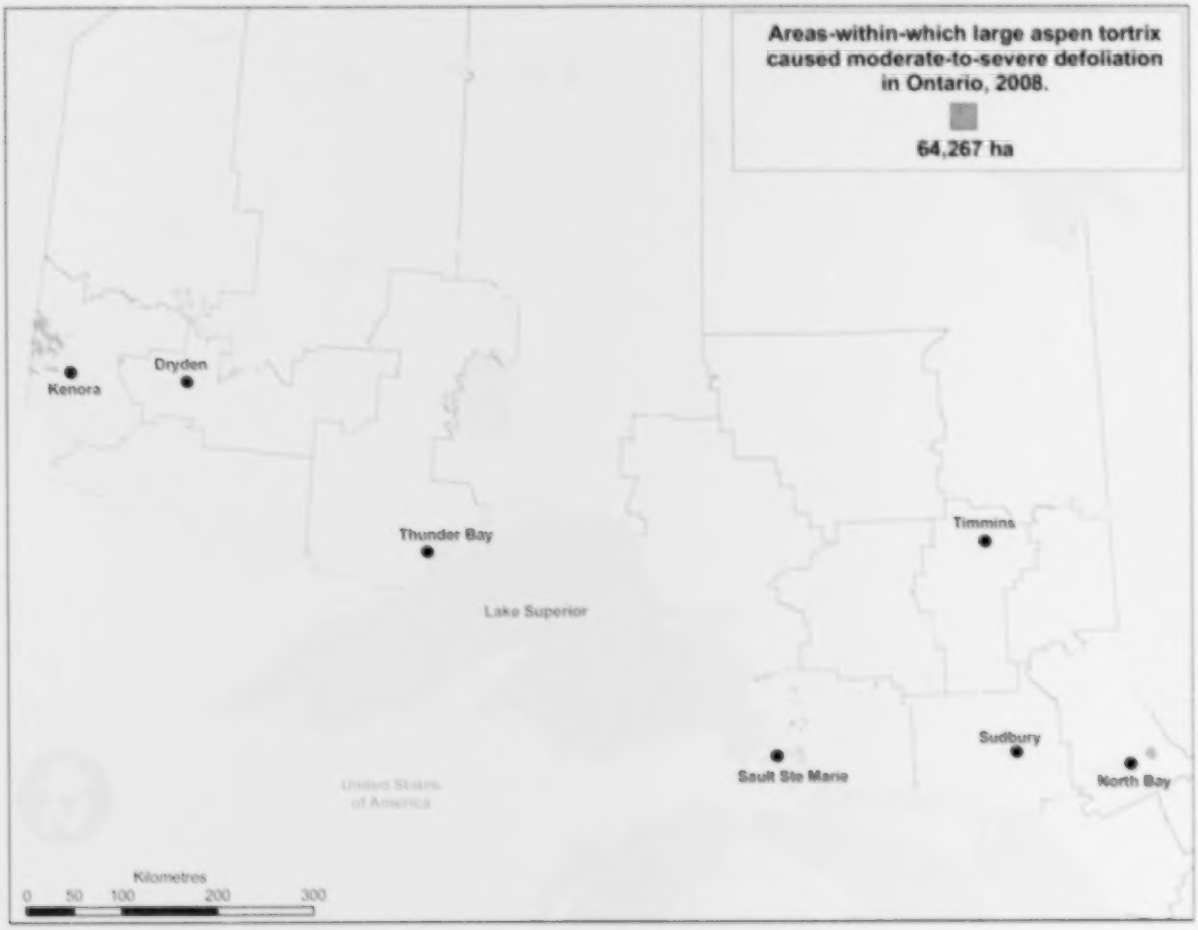



Figure 2.2 Areas-within-which large aspen tortrix caused moderate-to-severe defoliation in Ontario in 2008.

totalled 418,729 ha in 2008, a 50% reduction from 2007. The greatest reductions occurred in Southern Region in Algonquin Park, Kemptville, and Pembroke districts, as well as in North Bay District in Northeast Region (Table 2.2). For the third consecutive year, there was no eastern spruce budworm defoliation recorded in Northwest Region.

In Northeast Region, North Bay District, eastern spruce budworm defoliation declined by nearly half the total area as compared to 2007. Nonetheless, the largest and most northern infestation in 2008 occurred in this district, affecting 306,069 ha. The northeast portion of the district was most affected with a large area of moderate-to-severe defoliation mapped east of the Temiskaming River to the Quebec border and north from North Bay to Cobalt. On the west side of the district, areas infested in 2007 were reduced to scattered pockets (Figure 2.3) in 2008 and much of the River Valley area was nearly budworm-free this year. New pockets of defoliation were recorded north to Anima Nipissing Lake and around Temagami and Diamond lakes.

Whole-tree and top mortality of balsam fir and older white spruce is now evident at the south end of Lake Temagami in Scholes, Clement, Torrington, Pardo and McWilliams townships, North Bay District.

Table 2.2 Gross area of moderate-to-severe defoliation caused by the eastern spruce budworm in Ontario, 2004-2008.

| Region | Area of defoliation (ha) | | | | |
|---|---|---|---|---|---|
| District | 2004 | 2005 | 2006 | 2007 | 2008 |
| **Northwest** | | | | | |
| Kenora | 138 | 209 | 0 | 0 | 0 |
| Sub total | 138 | 209 | 0 | 0 | 0 |
| **Northeast** | | | | | |
| North Bay | 187,854 | 250,936 | 690,731 | 714,358 | 306,069 |
| Sault Ste. Marie | 0 | 302 | 3,250 | 7,405 | 5,191 |
| Sudbury | 40,448 | 47,768 | 72,739 | 111,380 | 102,917 |
| Sub total | 228,302 | 299,006 | 766,720 | 833,143 | 414,177 |
| **Southern** | | | | | |
| Algonquin Park | 0 | 0 | 0 | 1,994 | 0 |
| Aylmer | 0 | 0 | 0 | 0 | 0 |
| Bancroft | 6,675 | 0 | 0 | 0 | 0 |
| Kemptville | 11,381 | 9,238 | 6,341 | 4,469 | 0 |
| Midhurst | 0 | 0 | 0 | 0 | 47 |
| Parry Sound | 0 | 0 | 2,796 | 2,217 | 4,121 |
| Pembroke | 32,858 | 28,988 | 21,349 | 7,222 | 303 |
| Peterborough | 470 | 44 | 0 | 0 | 81 |
| Sub total | 51,384 | 38,270 | 30,486 | 15,902 | 4,552 |
| **Provincial total** | **279,824** | **337,485** | **797,206** | **849,045** | **418,729** |

In Sault Ste. Marie District there was a slight reduction in the area of defoliation to 5,191 ha in 2008 compared to 7,405 ha in 2007. This defoliation was located primarily north of the city of Sault Ste. Marie from Prince Township east to the Rankin Reserve. Smaller pockets of defoliation recurred near the Kirkwood Forest, Rydall Bank, and on St. Joseph Island.

Sudbury District saw little change in the area defoliated in 2008 compared to 2007. The second largest area of defoliation in Ontario was found in this district and covered approximately 102,917 ha. Pockets of infestations were mapped, extending from the North Bay District infestations in the Maskanonge Lake area to east of Lake Wanapitae. As was the case in 2007, these pockets extend south along Hwy. 69 to the Pickerel River. The largest area persisted around Onaping Falls through Blezard Valley, where tree mortality is starting to occur. Smaller affected stands were also found scattered through the Walden and Webbwood areas and as far west as May Township near Massey. Manitoulin Island had new pockets of defoliation in the Tehkummah, Assiginack, Sheguiandah, and Bidwell townships, as well as persistent pockets in Campbell, Carnarvon, Mills and Allan townships. Spruce and balsam fir mortality was recorded in Hagar, Loughrin and Davis townships in the eastern portion of Sudbury District.

Southern Region experienced fewer areas affected by eastern spruce budworm compared to 2007; however new small pockets of defoliation were found in Midhurst and Peterborough districts. Moderate-to-severe defoliation was recorded at two locations in Oro-Medonte

Township (formerly Medonte Township), Simcoe County; in Mulmur Township, Dufferin County; and in the Town of Chatsworth (formerly Holland Township), Grey County. All of these locations are in Midhurst District. The area affected totalled 47 ha. Algonquin Park, Kemptville and Bancroft districts were budworm-free in 2008.

Populations of the eastern spruce budworm were variable across Peterborough District in 2008. Moderate-to-severe defoliation was noted in a white spruce plantation at Balsam Lake Provincial Park in Bexley Township. Another white spruce plantation, averaging 24 m in height, had 70-85% current defoliation, in Cavan Monaghan Township, Peterborough District. The area affected in the above two plantations totalled 81 ha.

Stands defoliated by eastern spruce budworm were observed again in the northern portion of Parry Sound District near Grundy Lake Provincial Park, east of Georgian Bay near Key Junction and in Mowat and Blair townships, totalling 4,121 ha.

Pembroke District experienced a large reduction in areas defoliated with only 303 ha affected near Calabogie and Round lakes. Top and whole-tree mortality have resulted from repeated defoliation in the Renfrew area near Hurds Lake and north of Chenaux and Grants Settlement.



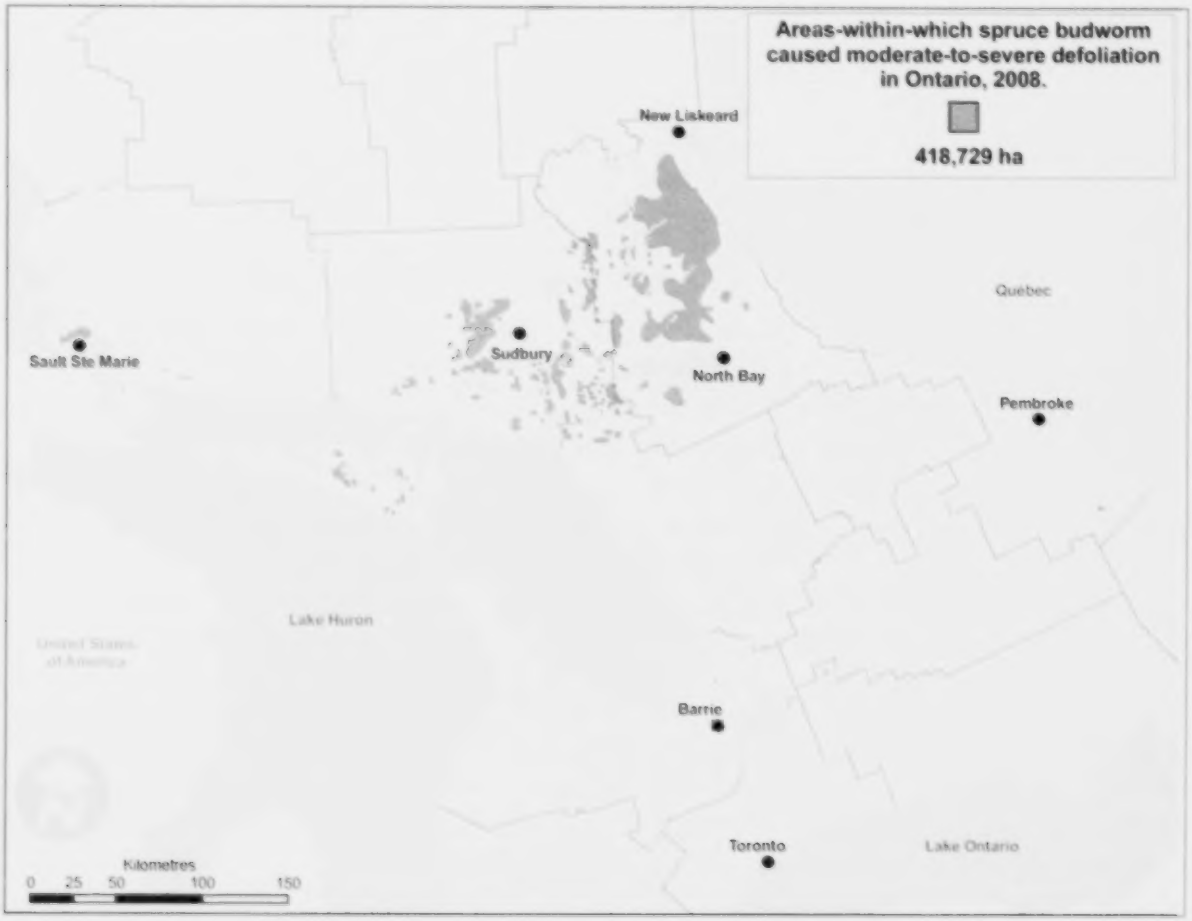



Figure 2.3 Areas-within-which eastern spruce budworm caused moderate-to-severe defoliation in Ontario in 2008.

## **Jack pine budworm**, *Choristoneura pinus pinus* (Free.)

For the fourth consecutive year, this destructive pest of jack pine *(Pinus banksianna,* Lamb.*)* defoliated jack pine stands in Ontario (Figure 2.4). In 2008, a total of 168,453 ha of budworm defoliation (Figure 2.5) was recorded in the province, a significant decrease from 536,051 ha of moderate-to-severe defoliation in 2007 (Table 2.3).

In Northwest Region, aerial surveys revealed 135,259 ha of moderate-to-severe defoliation. There was a considerable decline in defoliation in almost all of the districts affected in 2007, with the exception of Red Lake District where 115,041 ha of jack pine budworm defoliation was mapped in 2008 compared to 6,783 ha in 2007.

Figure 2.4 Jack pine budworm larva feeding on jack pine needles (photo by M. Francis).

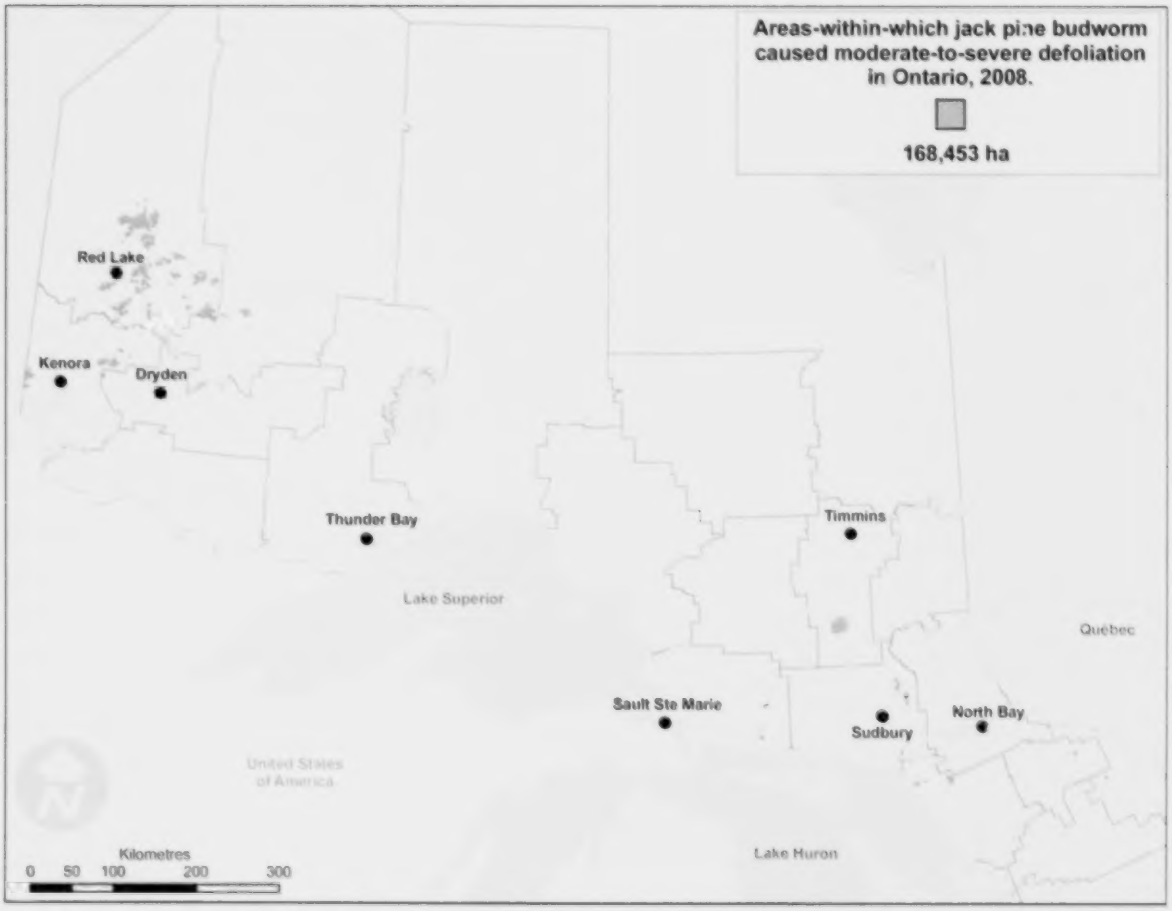



Figure 2.5 Areas-within-which jack pine budworm caused moderate-to-severe defoliation in Ontario in 2008.

Table 2.3 Gross area of moderate-to-severe defoliation caused by jack pine budworm in Ontario, 2004-2008.

| Region | Area of defoliation (ha) | | | | |
|---|---|---|---|---|---|
| District | 2004 | 2005 | 2006 | 2007 | 2008 |
| **Northwest** | | | | | |
| Dryden | 0 | 1,983 | 116,195 | 178,881 | 0 |
| Fort Frances | 0 | 85,328 | 355,134 | 41,020 | 0 |
| Kenora | 0 | 1,134 | 248,843 | 227,210 | 12,292 |
| Red Lake | 0 | 0 | 0 | 6,783 | 115,041 |
| Sioux Lookout | 0 | 0 | 0 | 9,065 | 7,926 |
| Thunder Bay | 0 | 0 | 0 | 892 | 0 |
| Sub total | 0 | 88,445 | 720,172 | 463,851 | 135,259 |
| **Northeast** | | | | | |
| North Bay | 0 | 0 | 0 | 306 | 0 |
| Sault Ste Marie | 0 | 953 | 951 | 2,502 | 2,356 |
| Sudbury | 851 | 2,599 | 14,038 | 42,775 | 4,092 |
| Timmins | 0 | 0 | 0 | 4,228 | 20,240 |
| Sub total | 851 | 3,552 | 14,989 | 49,811 | 26,688 |
| **Southern** | | | | | |
| Algonquin Park | 0 | 0 | 0 | 185 | 1,484 |
| Parry Sound | 0 | 0 | 4,548 | 21,674 | 4,760 |
| Pembroke | 0 | 222 | 407 | 530 | 262 |
| Sub total | 0 | 222 | 4,955 | 22,389 | 6,506 |
| **Provincial Totals** | **851** | **92,219** | **740,116** | **536,051** | **168,453** |

Damage in Red Lake District was mapped along the southwest shore of Trout Lake and north of Nungesser Lake between Kirkness and Storey lakes; all of this area is located to the north of the town of Red Lake. To the south of Red Lake, defoliation was mapped along the western shore of Pakwash Lake and around Bug and Insect lakes as well as along the boundary of Sioux Lookout and Red Lake districts and north of Upper Wapesi Lake along the eastern edge of the Whitemud Conservation Reserve. Several smaller satellite pockets were dispersed throughout the district.

In 2008, Kenora District had 12,292 ha of moderate-to-severe defoliation which was down significantly from 227,210 ha of moderate-to-severe defoliation mapped in 2007. The bulk of the 2008 defoliation was located west of the town of Kenora along the Ontario and Manitoba border in the northern section of Gundy Township and the southern section of Rice Township. There were also two other larger pockets of defoliation in the vicinity of Big Cannon Lake, near the western boundary of Dryden District. In addition there were a few smaller satellite pockets within the above areas.

In 2008, Sioux Lookout District had 7,926 ha of moderate-to-severe defoliation, a slight decrease from 9,065 ha mapped in 2007. Defoliation was recorded near Bingo Lake along the Red Lake and Sioux Lookout district boundaries, near the junction of Vermillion River Road and Spider Road. The other area affected by jack pine budworm in Sioux Lookout

District was south of the junction of Slate Falls and Vermillion River roads along the northern shores of Adamhay and March lakes. The defoliation extended north to Lynxpaw Lake between Root River in the east and Deadhorse Lake in the west.

In Northeast Region, there was a significant decrease in jack pine budworm defoliation in 2008. Aerially mapped defoliation decreased from 49,811 ha in 2007 to 26,688 ha in 2008.

On the eastern side of the region, jack pine budworm defoliation in North Bay District recurred in the same general areas as 2007, but severity was much less intense than the previous year. Light defoliation (<25% needle loss) totalling 362 ha in size was mapped in East Mills Township south of Port Loring.

Defoliation in Sault Ste. Marie District was also observed in 2008 in two previously defoliated areas. One area was located on the northeast shore of Lake Matinenda, Mack Township and the other northwest of Elliott Lake, Sagard Township. These two areas totalled 2,502 ha of moderate-to-severe defoliation.

Sudbury District in Northeast Region, had the greatest decrease in moderate-to-severe defoliation in 2008, as defoliation fell to 4,092 ha, compared to 42,775 ha in 2007. Defoliation was mapped on the north end of Wanapitei Lake in Aylmer Township, and along the eastern shore of Wanapitei Lake in Scadding Township. Although the area of defoliation was less in 2008, it recurred in the same general area as in 2007.

Timmins District had the greatest increase in mapped defoliation in 2008. The area increased almost five fold, with 20,240 ha of moderate-to-severe defoliation mapped in 2008 compared to the 4,228 ha mapped in 2007. Moderate-to-severe defoliation in Timmins District was mapped in Vrooman, Westbrook, and Champagne townships similar to 2007, but in 2008 the infestation expanded north and east into Londonderry, Garvey, Groves and Benneweis townships. These townships are all located south of Gogama and on the east side of Hwy 144, along Hwy 560. In 2008, Timmins District also had an additional 1,980 ha of light defoliation by jack pine budworm in the southwest corner of Vrooman Township.

Southern Region showed a significant decrease in total area defoliated, dropping from 22,389 ha of moderate-to-severe defoliation in 2007 to 6,506 ha in 2008. The largest decrease in area was found in Parry Sound District, which went from 21,674 ha in 2007 to 4,760 ha in 2008. Moderate-to-severe jack pine budworm defoliation was found in McKenzie, Wilson and Wallbridge townships as well as on the Magnetawan First Nation Reserve #1. Pockets of jack pine whole-tree and top mortality were also recorded in the latter two locations totalling 1,326 ha.

In Pembroke District, areas of defoliation were mapped in Richards Township and Algonquin Park. The total area defoliated in the two areas was 1,746 ha, up from 715 ha in 2007. The Richards Township area (262 ha) was mapped in the vicinity of Turner Road extending into Bonnechere Provincial Park. In Algonquin Park, the mapped area east of Lake Traverse (1,484 ha) was an expansion of the area mapped in 2007.

## Jack pine budworm forecast for 2009

The majority of the life cycle of the jack pine budworm is spent as an overwintering second instar larva (L2) in silken shelters (hibernacula) under bark and branch scales from August until the following spring. This stage of its life cycle provides the opportunity to sample branches (Figure 2.6), extract the larvae and count them to forecast the severity of defoliation the following spring and summer. The defoliation forecast from the L2 survey is used to plan and implement integrated insect pest management programs which may be needed. The management programs may include salvage harvesting, accelerated harvests, re-allocating of stands for harvesting, aerial spray programs, no action, or a combination of these options.

Figure 2.6 Forest health technical specialist sampling jack pine branches (photo by M. Francis).

Table 2.4 Jack pine budworm defoliation forecast criteria.

| Average L2 per branch | Defoliation forecast |
|---|---|
| 0 | nil |
| 0.1-15 | light |
| 16-54 | moderate |
| ≥55 | severe |

To forecast jack pine budworm defoliation in 2009, L2 population estimates were done at 224 locations in the fall of 2008 and the first two months of 2009. Locations were selected in and around the current infestation in the province as well as areas that have historically had jack pine budworm defoliation. Locations also included high value areas as identified by sustainable forest licensees.

At each location, a 1 m long branch was cut from the mid-crown of each of 10 trees. The branches were then put through a sodium hydroxide washing procedure to extract the overwintering larvae which were then counted. The defoliation forecast is based on the average number of L2 per branch (Table 2.4), using criteria developed by the Canadian Forest Service.

In Northwest Region, a total of 122 locations (1,220 trees) were sampled in 2008 (Table 2.5). All L2 locations in the region were in jack pine stands in Red Lake and Sioux Lookout districts, in and around areas with moderate-to-severe defoliation in 2008.

With a few exceptions, the L2 survey is forecasting very little defoliation for 2009 (Table 2.5). Out of the 224 plots, 203 (90.6%) of them are forecasting either nil or light defoliation. Only 21 plots are forecasting moderate defoliation, while none of the plots are forecasting severe defoliation.

In Northwest Region, jack pine budworm defoliation is expected to be concentrated in Red Lake District, mostly north of Nungessor Lake. Much of this area in the Whitefeather Forest was already defoliated in 2008.

In Northeast Region, only Timmins District is expected to have jack pine budworm defoliation in 2009. The majority of this should occur south of Gogama, along the Highway 560 corridor east of Highway 144.

There were only 8 L2 plots in Southern Region. All of these are forecasting light defoliation for 2009.

The actual area and severity of defoliation in 2009 may be greater than forecasted by the L2 survey. In the areas where defoliation is expected (Red Lake, Sioux Lookout, Timmins, Algonquin Park, and Bonnechere Provincial Park), the budworm population may still be in the increasing phase of its outbreak. The cool wet weather of 2008 may have only temporarily dampened the population. Should there be a hot dry spring in 2009, the budworm may have higher survival than in 2008 and cause more severe defoliation than the L2 survey would suggest.

Table 2.5 Jack pine budworm defoliation forecasts in Ontario for 2009.

| Region | Total locations | Defoliation Forecast | | | |
|---|---|---|---|---|---|
| District | sampled | Nil | Light | Moderate | Severe |
| **Northwest** | | | | | |
| Red Lake | 98 | 0 | 84 | 14 | 0 |
| Sioux Lookout | 24 | 2 | 22 | 0 | 0 |
| Sub total | 122 | 2 | 106 | 14 | 0 |
| **Northeast** | | | | | |
| Chapleau | 12 | 1 | 11 | 0 | 0 |
| Sault Ste. Marie | 4 | 0 | 4 | 0 | 0 |
| Sudbury | 37 | 9 | 28 | 0 | 0 |
| Timmins | 41 | 0 | 34 | 7 | 0 |
| Sub total | 94 | 10 | 77 | 7 | 0 |
| **Southern** | | | | | |
| Pembroke | 8 | 0 | 8 | 0 | 0 |
| Sub total | 8 | 0 | 8 | 0 | 0 |
| **Provincial total** | 224 | 12 | 191 | 21 | 0 |

## Jack pine forest health plots

In the mid 1990's, jack pine plots were established across northeastern and northwestern Ontario to monitor and study the impacts of jack pine budworm. In 2000, the focus of these

plots was revised to include the health of jack pine forests across northern Ontario. These permanent sample plots are monitored annually independent of any jack pine budworm infestation. Thus the results described below are for the permanent samples plots only. They do not necessarily reflect the impacts of the current jack pine budworm outbreak except where the plots are within the budworm infestation.

A total of 128 plots comprising 6,400 trees (62 plots in Northeast Region, 66 plots in Northwest Region) were assessed in 2008. The trees were rated for the presence of any pest, disease or abiotic factors that affect jack pine as well as the abundance of male (pollen) flowers. Three stands were harvested in 2008, bringing the total number of plots monitored to 128, down from 131 evaluated in 2007. One of those stands was in Northeast Region and the other two were in Northwest Region.

In 2008, jack pine tree condition in the plots was similar in both northeastern and northwestern Ontario. The majority of the trees had less than 50% total defoliation of old and current foliage (Table 2.6). Slightly higher levels of defoliation were recorded in northwestern Ontario.

The tops of the jack pine trees were relatively healthy in both regions, although jack pine tops in Northwest Region had a higher rate of mortality following the jack pine budworm outbreak (Table 2.7). Surveys revealed a significant difference in male flower abundance. In Northwest Region only 12% of the trees had moderate to high numbers of male flower abundance, compared to 80% of the trees in Northeast Region. The jack pine budworm outbreak may have triggered some trees to reduce pollen production in Northwest Region.

As shown in Table 2.8, very few of jack pine plots are actually being affected by the current outbreak. Furthermore, average defoliation in the affected plots has been quite low, at only 29% in the northeast and 18% in the northwest.

Table 2.6 Condition of all trees in jack pine forest health plots in Ontario.

| | Tree Condition (% of trees) | | | | | |
|---|---|---|---|---|---|---|
| | Total defoliation (%) | | | | Mortality | |
| Region | <25 | 25-50 | 51-75 | >75 | New | Old |
| Northeast (n=3100) | 49 | 17 | 3 | 2 | 2 | 29 |
| Northwest (n=3300) | 41 | 24 | 4 | 2 | 3 | 26 |

Table 2.7 Condition of all tree tops and abundance of flowers of live trees in jack pine forest health plots in Ontario.

| | Tree Condition (% of trees) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Tree Top | | | Abundance of Flowers | | | |
| Region | Live | Bare | Dead | Nil | Light | Moderate | High |
| Northeast (n=3100) | 97.2 | 1.4 | 1.4 | 5 | 15 | 20 | 60 |
| Northwest (n=3300) | 97.0 | 0.7 | 2.3 | 45 | 43 | 10 | 2 |

Table 2.8 Average current defoliation by jack pine budworm in jack pine forest health plots affected by jack pine budworm in Ontario.

| Region | Number of plots affected | Average current defoliation (%) |
|---|---|---|
| Northeast | 7 | 29 |
| Northwest | 9 | 18 |

## **Forest tent caterpillar**, *Malacosoma disstria* (Hbn.)

Forest tent caterpillar populations continued to decline in 2008; the area of moderate-to-severe defoliation totalled 42,858 ha, a dramatic decrease from 2007 when 371,494 ha were affected (Table 2.9). The infestation is breaking up as indicated by the sporadic and discontinuous pattern of defoliation (Figure 2.7). There was also a high frequency of diseased and parasitized larvae and pupae observed this year. Collections of larvae showed evidence of disease, virus and microsporidia, as well as the parasitic fly, *Arachnidomyia aldrichi* (Park.), all of which are indicative of a collapsing population.

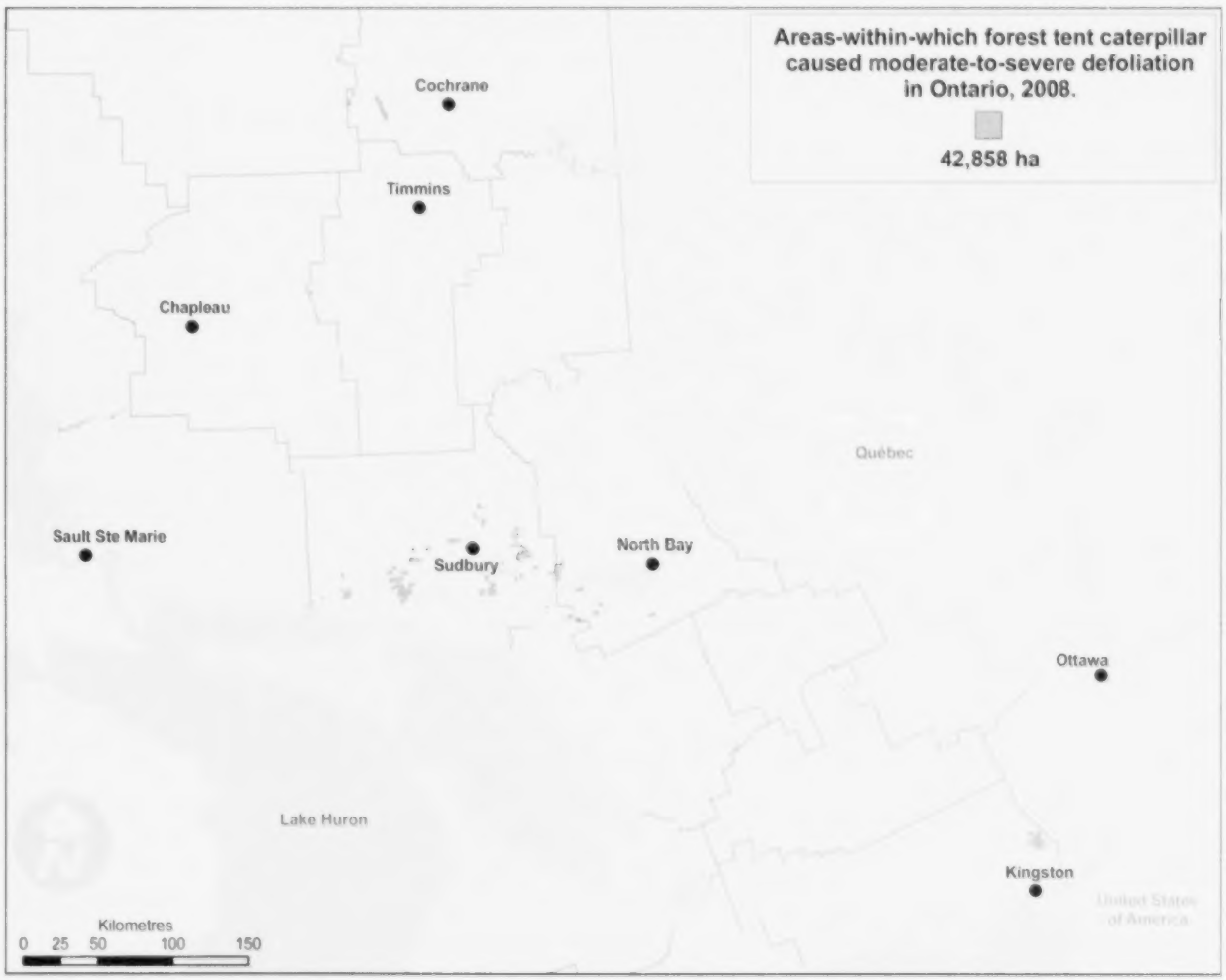



Figure 2.7 Areas-within-which forest tent caterpillar caused moderate-to-severe defoliation in 2008.

While the majority of the infested areas were once again in Sudbury District, areas of infestation were also recorded in Cochrane and North Bay districts, Northeast Region, and in Parry Sound and Peterborough districts, Southern Region.

Table 2.9 Gross area of moderate-to-severe defoliation caused by the forest tent caterpillar in Ontario, 2004-2008.

| Region | Area of defoliation (ha) | | | | |
|---|---|---|---|---|---|
| District | 2004 | 2005 | 2006 | 2007 | 2008 |
| **Northwest** | | | | | |
| Nipigon | 583,505 | 0 | 0 | 0 | 0 |
| Thunder Bay | 22,991 | 0 | 0 | 0 | 0 |
| Sub total | 606,496 | 0 | 0 | 0 | 0 |
| **Northeast** | | | | | |
| Cochrane | 0 | 0 | 0 | 0 | 3,958 |
| Hearst | 29,223 | 0 | 0 | 3,740 | 0 |
| Kirkland Lake | 2,549 | 0 | 0 | 0 | 0 |
| North Bay | 143,239 | 28,501 | 4,946 | 13,615 | 6,209 |
| Sudbury | 458,767 | 435,399 | 355,532 | 351,003 | 29,963 |
| Timmins | 3,459 | 0 | 0 | 0 | 0 |
| Sub total | 637,237 | 463,900 | 360,478 | 368,358 | 40,129 |
| **Southern** | | | | | |
| Kemptville | 0 | 0 | 0 | 27 | 0 |
| Midhurst | 1,915 | 0 | 0 | 0 | 0 |
| Parry Sound | 31,886 | 5,932 | 10,281 | 2,135 | 224 |
| Peterborough | 0 | 0 | 0 | 974 | 2,505 |
| Sub total | 33,801 | 5,932 | 10,281 | 3,136 | 2,729 |
| **Provincial total** | **1,277,534** | **469,832** | **370,759** | **371,494** | **42,858** |

# FOREST ABIOTIC EVENTS

## Freezing of conifers

In 2007, a combination of weather anomalies caused browning of 1-year old and older conifer needles within a 346,080 ha area of the boreal forest in Hearst, Cochrane and Kirkland Lake districts, Northeast Region (Figure 2.8). The majority of the damage was aerially mapped north of Hearst and Kapuskasing in Hearst District. Winter snow accumulation was lower than usual in these areas during the winter of 2006/2007, and when combined with sudden extreme temperature fluctuations in the spring, needle mortality occurred.

**Figure 2.8** Severe foliar browning of conifers in 2007, Bannerman Lake area, Hearst District (photo by A. Keizer).

In 2007 naturally occurring understory and planted conifer trees had foliage frozen up to approximately 8 m high whereas the foliage in the upper crown and at ground level was less affected. The majority of damage was observed on the lower crowns of primarily balsam fir, white and black spruce, tamarack (*Larix laricina* (DuRoi) K. Koch) and jack pine. Weather anomalies included unusually warm days in April 2007 (e.g. +24.0°C on April 22nd) which induced a premature loss of cold hardiness of the needles, followed by a sudden drop in temperature to -0.5°C on April 23rd. The weather in May 2007 was also abnormal. May 18th was +24.8°C, followed the next morning by a snowfall and an overnight low temperature of -6.1°C. The minimum daily temperatures of -8°C and -9°C were recorded at the Kapuskasing airport, May 19-21 while a heavy snowfall occurred on May 19. In addition, reduced levels of winter snow cover with the extremely cold winter temperatures may have induced deeper than normal frost penetration in the ground.

The brown and dead foliage was shed from the 1 year old and older shoots during 2007. Most of the trees still broke bud in 2007, and started to recover from the loss of older needles. By the end of the 2008 growing season, little evidence of the original event remained. Tree recovery was enhanced by the higher-than-average precipitation in 2008 that resulted in very lush growth on the new shoots (Figure 2.9).

In 2008, intensive ground and aerial surveys were done in the areas affected by the freezing events of 2007. The surveys showed that in 2008 there were very low mortality rates to conifer trees in the areas affected the previous year across Northeast Region. Ongoing monitoring is continuing to determine the long term effects of this freezing event.

Figure 2.9 – Bannerman Lake area, Hearst District in 2008 showing minimally affected conifers with new, lush green foliage (photo by A. Kreizel)

# Invasive Species in Ontario's Forests

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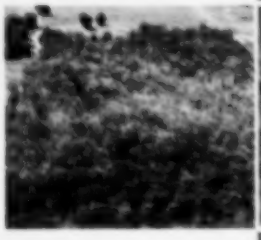


## FOREST INSECTS

### Pine false webworm, *Acantholyda erythrocephala* (L.)

This web-spinning sawfly was introduced from Europe, having been first found in Pennsylvania in 1925. In Ontario it attacks many species of pine both introduced (Austrian pine (*Pinus nigra* Arnold) and Scots pine (*P. sylvestris* L.)) and native (eastern white pine (*P. strobus* L.), red pine (*P. resinosa* Ait.), and jack pine (*P. banksiana* Lamb.)).

Populations of this exotic sawfly continued to decline in Ontario with only 26 ha of moderate-to-severe defoliation recorded in 2008. This compares to 377 ha recorded in 2007 (Table 3.1).

In Southern Region, eastern white pine was the affected host in 2008, with five plantations in Grey County sustaining moderate-to-severe defoliation. Two of these stands were located east of Durham and north of Welbeck in the Township of West Grey; two others were in the Township of Chatsworth, south of Massie, while the fifth was located east of Cargill, Brockton Township, Midhurst District.

Table 3.1 Area of moderate-to-severe defoliation caused by pine false webworm, 2004-2008.

| Region | Area of defoliation (ha) | | | | |
|---|---|---|---|---|---|
| District | 2004 | 2005 | 2006 | 2007 | 2008 |
| Southern | | | | | |
| Midhurst | 1,100 | 691 | 286 | 377 | 26 |
| Peterborough | 91 | 41 | 0 | 0 | 0 |
| **Provincial total** | **1,191** | **732** | **286** | **377** | **26** |

Infestations were also noted on three small islands in South Bay of Lake Nipissing where mature and immature eastern white pine trees were 70-80% defoliated.

In the Northwest Region, additional small populations of pine false webworm were recorded in Thunder Bay District. In a mixed plantation of bur oak (*Quercus macrocarpa* Michx.) and red pine on the west side of the city of Thunder Bay, moderate defoliation was noted on young red pine trees. During a plantation survey near Kakabeka Falls, light defoliation from this sawfly was recorded on a small number of young jack pine trees.

## **Emerald ash borer**, *Agrilus plannipennis* Fairmaire

Emerald ash borer (EAB) is an exotic buprestid beetle from Asia that is thought to have invaded Ontario after first establishing in the Detroit area of Michigan. EAB was discovered in Ontario in the city of Windsor in 2002 by OMNR and CFS Forest Health staff. By the end of 2007, populations were detected by the Canadian Food Inspection Agency (CFIA) throughout Essex County and the Municipality of Chatham-Kent; St. Clair Township, Lambton County; City of London, Middlesex County; and north of Turkey Point, Norfolk County, with MNR detecting EAB in the Municipality of Dutton-Dunwich, Elgin County and in the city of Toronto.

In 2008, further discoveries of EAB populations were reported by municipalities and confirmed by the CFIA at several locations in Ontario. New infestations were found in Ottawa, Oakville, Pickering, Mississauga, Brampton, Vaughan, and in the north in Sault Ste. Marie. These new finds were in urban areas. The CFIA also detected EAB near the community of Bayfield in the municipality of Bluewater at a private campground. The long distance spread of EAB beyond the original infestation of southwestern Ontario and southeastern Michigan is likely a result of people moving infested ash materials, particularly firewood.

**Figure 3.1** Emerald ash borer larva and gallery in cambial layer of ash (photo by E. Czerwinski).

This invasive insect attacks all species of ash (*Fraxinus* sp.). The adult beetle conducts maturation feeding on foliage, before the adults mate and lay eggs. While this results in some loss of leaf surface area, it is the larvae which kill the tree by feeding on the cambium and nearby tissues under the bark. The serpentine tunnels created by the larvae eventually kill the tree by disrupting its vascular system (Figure 3.1).

The emerald ash borer, ash material, nursery trees, and firewood movement are all regulated by the Canadian Food Inspection Agency (CFIA), Plant Quarantine Division. Areas regulated by the CFIA now include Essex County and the Municipality of Chatham-Kent, Lambton, Elgin, Middlesex and Norfolk Counties along with the Greater Toronto Area (Figure 3.2). Areas with new findings in 2008 are being surveyed by the CFIA to determine the extent of the infestations. Changes to the areas regulated by Ministerial Order may be forthcoming pending the outcome of these additional surveys.

Figure 3.2 Areas regulated for the emerald ash borer by the Canadian Food Inspection Agency in 2007.

## Asian long-horned beetle, *Anoplophora glabripennis* (Motsschulsky)

The Asian long-horned beetle was discovered in 2003 infesting trees in the border area between the city of Vaughan and the north end of Toronto. It was likely introduced from Asia in crates, packing material or pallets. The Canadian Food Inspection Agency (CFIA) is the lead agency responsible for preventing, eradicating, and managing regulated pests in Canada. In collaboration with the municipalities, Natural Resources Canada (Canadian Forest Service), Ontario Ministry of Natural Resources, Toronto Region Conservation Authority, and U.S. Department of Agriculture (Agriculture Research Service), the CFIA has implemented an aggressive survey and tree removal campaign to eradicate Asian long-horned beetle. Most tree removals occurred in 2004. All known infested host trees and any host trees within 400m of an infested tree were removed and chipped. Surveys to detect Asian long-horned beetle have continued each year, with additional tree removals in 2005 and again in 2007 following detections of residual populations in each of those years. In 2007, the host tree removal area around known infested trees was reduced to 200m, rather than 400m, because the newly detected infestations were thought to have existed for two years or less.

The CFIA established a regulated area to prevent the spread of this invasive insect in 2004. This prohibits the movement of tree material from the regulated area to areas outside unless otherwise authorized by the CFIA. New detections of the beetle in 2005 and 2007 were all within the boundaries of the regulated area (Figure 3.3).

There were no detections of infested or suspect trees in 2006 or 2008.

## **Larch casebearer**, *Coleophora laricella* (Hbn.)

A native of Europe, the larch casebearer was first detected in North America as far back as 1886 when it was found in Massachusetts. It occurs throughout the range of tamarack (*Larix laricina* [Du Roi] K. Koch), from southeastern Manitoba and central Minnesota east to Newfoundland. It also occurs in western North America on western larch (*Larix occidentalis* Nutt.). Outbreaks in Canada have occurred at about 8-year intervals. While twig mortality and growth loss are common, trees defoliated 2 or more years can be killed.

A total of 273 ha of moderate-to-severe defoliation by larch casebearer was aerially mapped in the Southern Region in 2008 (Figure 3.4). Several small pockets of defoliation were also recorded from the ground.

Figure 3.3 Map of regulated area for Asian long-horned beetle depicting infested areas within, 2008.

The total area defoliated in Midhurst District was 259 ha in 2008, a slight increase over the 227 ha recorded in 2007. Larch casebearer caused moderate-to-severe defoliation to tamarack in the Minising Swamp, Springwater Township, Simcoe County. Another smaller area, also in Simcoe County, was mapped south of Bass Lake just west of Orillia on the Orillia-Oro townline. A number of small pockets of defoliation were also observed near Lamlash, West Grey Township and near Glencairn, Clearview Township, all located within Midhurst District.

In addition, there were several small pockets of defoliation at widely scattered locations throughout Aurora and Guelph districts. These occurred in the Township of Scugog, Durham Region; in the Town of Milton, Aurora District; and further west near Ancaster, Guelph District where 14 ha of tamarack forest were infested (Figure 3.4).

In Peterborough District, populations of larch casebearer were considerably lower than in recent years, although 50-75% defoliation was still recorded in a 5 ha tamarack stand at Hwy. 7 & Frontenac Road, Central Frontenac Township.

Moderate defoliation occurred in Limerick Forest along Forsyth Road (5 ha) and Hwy. 10 (8 ha) in the Sandown area, Caledonia Township, Kemptville Distirct.



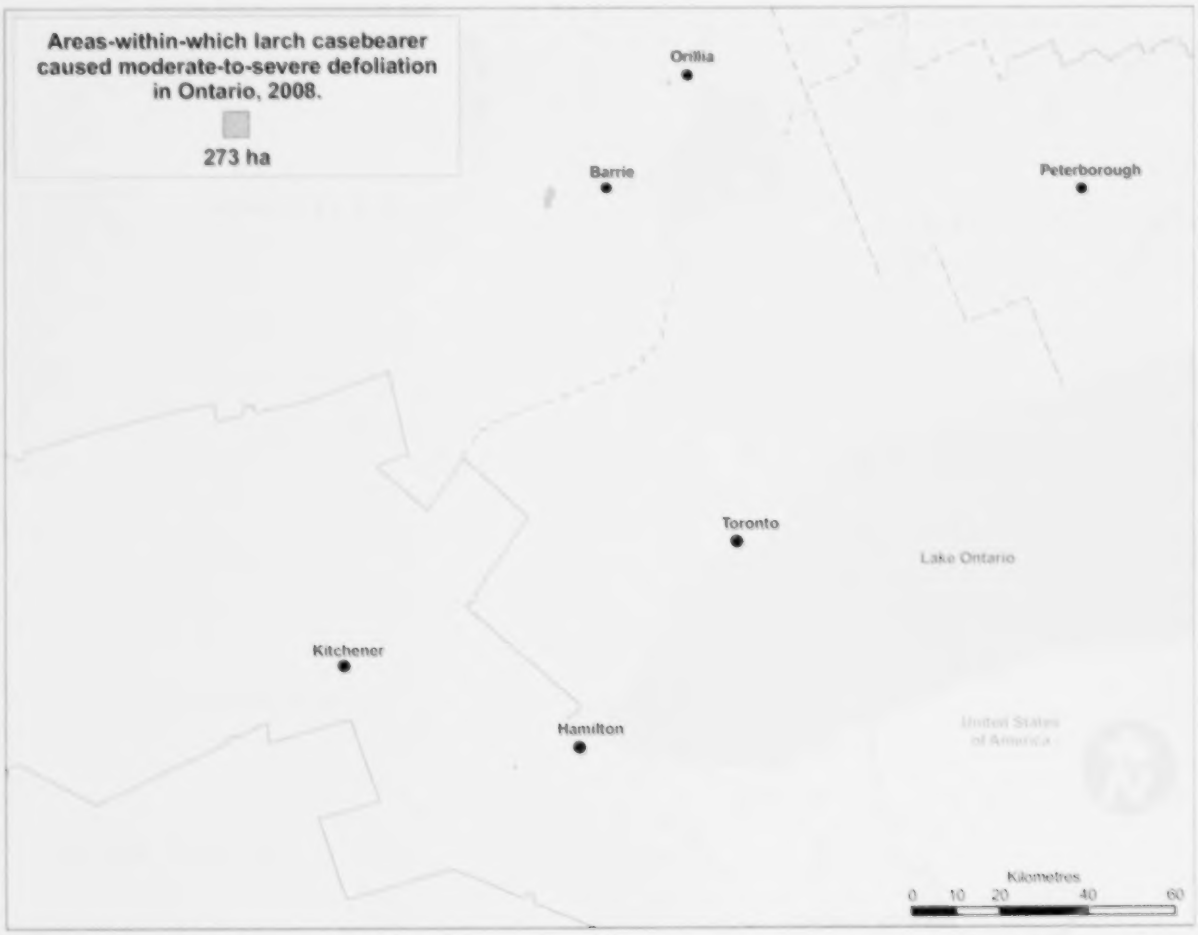



Figure 3.4 Areas-within-which larch casebearer caused moderate-to-severe defoliation in Ontario in 2008.

Tree mortality has occurred throughout most large concentrations of tamarack adjacent to low wet areas across the region where larch casebearer has persisted for the past several years. Tree mortality is thought to be caused by the combined effects of defoliation by larch casebearer, which often is followed by colonization by the eastern larch beetle (*Dendroctonus simplex* LeConte), with drought as a potentially contributing factor.

## **Birch tubemaker**, *Acrobasis betulella* Hulst., **birch casebearer**, *Coleophora serratella* (L.) and **lesser birch casebearer**, *C. comptoniella* (McD.)

These three insects are reported together as they often co-occur. Birch tubemaker is a native insect common on white birch (*Betula* papyrifera Marsh.) in eastern North America. Birch casebearer is a European insect that occurs from Ontario eastward, after it was first detected in Maine in 1927. The lesser birch casebearer is native to North America, feeding on birch, alder (*Alnus* spp.), and sweetfern (*Comptonia peregrine* L.).

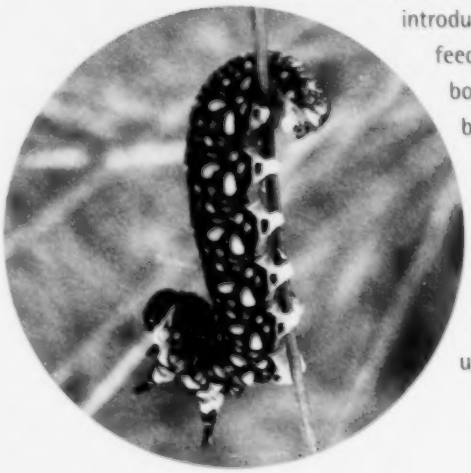


The birch tubemaker, casebearer and lesser birch casebearer were recorded in Southern Region at low levels in 2008.

In Parry Sound District, birch casebearer damage was recorded at moderate levels at one location along Horseshoe Lake Road. In Midhurst District, white birch along Highway 6 in the Bruce County Forest had light damage from the combined effects of birch casebearer, birch tubemaker, and lesser birch casebearer.

## **Introduced pine sawfly**, *Diprion similis* (Htg.)

Introduced pine sawfly was first found in Ontario near Oakville in 1931 and has since spread to many areas of the province. While two generations per year of this insect are common, a third generation sometimes occurs during extended periods of warm fall weather. The first larval period is in early summer while the second occurs in August and September. More than one generation can be present at the same time, with the third generation feeding into November or even December. Young larvae are initially gregarious, feeding together as a colony on 1 year old or older needles. Unlike most sawflies the mature introduced pine sawfly larvae do not feed in colonies but instead feed individually, dispersed throughout the tree crown eating both new and old foliage. When populations are high, trees can be completely defoliated in one season which often results in tree mortality. The introduced pine sawfly occurs on all pine (*Pinus* spp.) with eastern white pine (*P. strobus* L.) the favoured host in Ontario. Mature larvae are distinctly coloured black, white and yellow (Figure 3.5).



In recent infestations in Ontario, populations have built-up rapidly within a few years, then collapsed just as quickly.

Figure 3.5 Introduced pine sawfly larva (photo by H. Evans).

The last major occurrence in Ontario was in 2000 when 8,573 ha of eastern white pine sustained moderate-to-severe defoliation in the Pointe au Baril and Nobel area of Parry Sound District, Southern Region.

In 2008, only light defoliation was observed in Midhurst District, Southern Region. Even though a relatively high population was detected at the Millennium Tract of the Simcoe County Forest where a mass collection of over 500 second generation larvae was made from 3 m trees, defoliation at this site was barely visible. Low populations were also detected in Carling Township, Parry Sound District and in Cox Township, Sudbury District.

## **Beech scale**, *Cryptococcus fagisuga* Linding.

This exotic Beech scale pest, associated with the exotic fungus (*Nectria coccinea* (Pres.:Fr.) Fr. var. *faginata* Lohman, Watson & Ayers), which causes beech bark disease was accidentally introduced to North America via Halifax, Nova Scotia in 1890. The scale insect inserts its stylet into the bark of the beech trees, creating an entry point for the fungus that causes beech bark disease.

Beech scale is present in many woodlots in southern Ontario. In 2008 high populations of scale were observed and collected from Awenda Provincial Park where beech disease is known to be present.

## **Satin moth**, *Leucoma salicis* (L.)

First recorded in Massachusetts in 1920, satin moth continues to expand its range in Ontario where it prefers to feed on poplars or hybrid poplars (*Populus* spp.) of European origin.

Defoliation of poplar (*Populus* spp.) by satin moth was reported in Peterborough, Bancroft, Sudbury, and Midhurst districts, and for the first time on record, North Bay District. The North Bay infestation represents an extension of the known range for this species.

Severe defoliation on Carolina poplar (*Populus x canadensis* Moench) and European white poplar (*P. alba* L.) (Figure 3.6) was noted at widely separated sites throughout the Peterborough and Bancroft Districts.

Sudbury District showed a decrease in defoliation for the first time in five years as populations declined throughout the city of Sudbury and outlying communities. The only noticeable defoliation was found on Carolina poplars in the town of Garson.

In Midhurst District, prevalence of this insect was not as high as in recent years. However, severe defoliation was found at two separate locations on small numbers of roadside host trees.

Figure 3.6 Satin moth larvae on European white poplar (*Populus alba* L.), 2008 (photo by P. Hodge).

## **Gypsy moth**, *Lymantria dispar* (L.)

The gypsy moth, *Lymantria dispar* (L.) is an insect of European origin and is one of many invasive forest pests of concern in Ontario (Figure 3.7). It was first found in Ontario in 1969 after its introduction to North America at Bedford, Massachusetts in 1869. The insect thrives in mixed-wood and hardwood forests throughout southern Ontario. The northern limit of its range runs from Sault Ste. Marie east to North Bay and Mattawa, with an isolated pocket in New Liskeard. Overall moderate-to-severe defoliation by this invasive pest increased in Ontario from 31,094 ha in 2007 to 39,476 ha in 2008 (Figure 3.8). This increase in gypsy moth defoliation was mostly a result of a new infestation of 16,719 ha in Northeast Region, whereas defoliation in Southern Region declined by 27%.

Figure 3.7 Gypsy moth larva (photo by E. Czerwinski).



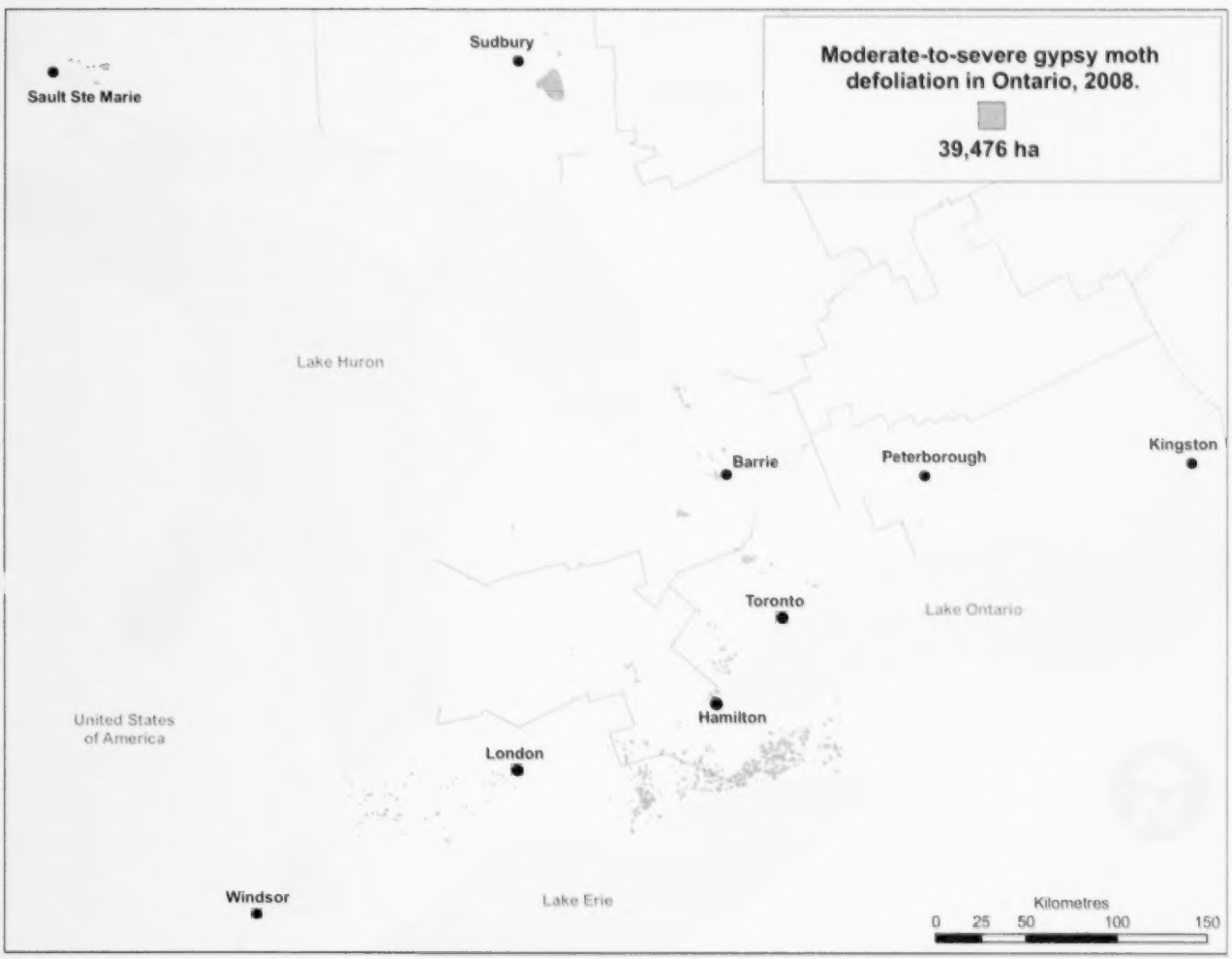



Figure 3.8 Areas within which gypsy moth caused moderate-to-severe defoliation in Ontario, 2008.

In Northeast Region, the majority of moderate-to-severe defoliation was mapped in Sudbury District. Defoliation totaled 15,507 ha in the central and southern portions of the district (Table 3.2). Defoliation was recorded southeast of Sudbury and east of Whanapitae near the Sudbury airport on various species of hardwoods.

In Sault Ste. Marie District, 1,212 ha of moderate-to-severe defoliation were recorded in many scattered pockets just east of the city of Sault Ste. Marie. This infestation occurred on rocky ridges containing a high oak component.

High levels of nucleopolyhedrosis virus (NPV) and the larval fungus *Entomophaga mamaiga* Humber, Shimazu and Soper (Figure 3.9) were noted in both districts in the Northeast Region which will likely result in a population decline in these areas in 2009.

Even though Guelph District had almost half of the total defoliation in Southern Region, this district still experienced a considerable decrease in moderate-to-severe defoliation compared to 2007. Guelph District had 11,136 ha of moderate-to-severe defoliation in 2008, 40% less than that recorded in 2007. This decrease may be attributed to private land foliage protection programs and the cool and wet weather conditions which favoured the development of the *Entomophaga maimaiga* larval disease. The majority of the defoliation was in the southern end of the district, similar to that found in 2007; however, new populations were recorded in the eastern portion of the Niagara Peninsula, in the west and south ends of Brant County, and along the Grand River in central Waterloo County. An additional 335 ha of light defoliation by gypsy moth occurred in the eastern portion of the Niagara Peninsula.

In Aylmer District, 6,854 ha of moderate-to-severe gypsy moth defoliation was recorded in 2008 with an additional 674 ha of light defoliation. The intensity of defoliation was less severe than that recorded in 2007 but the total area of moderate-to-severe defoliation increased by 2,790 ha in 2008. Pockets of defoliation occurred as far west as Sarnia and in smaller pockets throughout Lambton County and the southern portion of Middlesex County.

A new infestation was detected in Midhurst District with 2,459 ha of moderate-to-severe defoliation recorded in 2008. The majority of defoliation was detected in the northeast portion of the district. A large continuous stretch of defoliation was located in the Main Tract of Dufferin County Forest and in the adjoining Tosorontio Tract of Simcoe County Forest. Infestations were also noted on hilltops with a high composition of oak (*Quercus* spp.) north and east of Barrie. Similarly, there were infested areas further north in Midland, Penetanguishene, and Awenda Provincial Park areas.

In Aurora District, moderate-to-severe defoliation by gypsy moth reached 2,292 ha in 2008, an increase of just over 800 ha from that of 2007. Despite this overall increase, gypsy moth defoliation declined in the far south of Aurora District, particularly in the Burlington and Oakville area. Populations in these areas were reduced by both natural causes (i.e. fungal and viral infections of the larvae) and by aerial spray programs

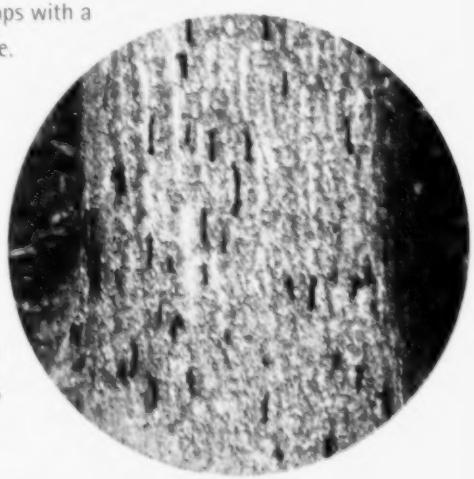


Figure 3.9 Dead gypsy moth larvae infected with the fungus *Entomophaga mamaiga* (photo by E. Czerwinski).

conducted by landowners and municipalities, thereby lessening the impact of gypsy moth in the area. These declines were more than offset by increased defoliation further north in the district. Newly infested areas occurred east of Milton, in the Georgetown area, and near Terra Cotta in the western portion of the district. There were also new areas of infestation along the Rouge River valley in the city of Scarborough; in the Ganaraska Forest of Durham Region; in the surrounding area of Bayview Avenue and Stouffville Road in Richmond Hill; along Dufferin Street in the city of Vaughan; and in a large area on the Oak Ridges Moraine in King Township. This last area was by far the largest single area of defoliation in Aurora District in 2008.

Defoliation in Peterborough District totaled 16 ha and was an extension of the infestation in the Ganaraska Forest in Aurora District.

Table 3.2 Gross area of moderate-to-severe defoliation caused by gypsy moth in Ontario from 2004 to 2008.

| Region | Area (ha) | | | | |
|---|---|---|---|---|---|
| District | 2004 | 2005 | 2006 | 2007 | 2008 |
| **Northeast** | | | | | |
| North Bay | 177 | 0 | 132 | 0 | 0 |
| Sault Ste. Marie | 0 | 0 | 0 | 0 | 1,212 |
| Sudbury | 0 | 0 | 0 | 0 | 15,507 |
| Sub total | 177 | 0 | 132 | 0 | 16,719 |
| **Southern** | | | | | |
| Aurora | 0 | 69 | 445 | 1,474 | 2,292 |
| Aylmer | 16 | 32 | 776 | 4,064 | 6,854 |
| Bancroft | 248 | 0 | 0 | 0 | 0 |
| Guelph | 0 | 1,141 | 8,956 | 25,556 | 11,136 |
| Kemptville | 0 | 0 | 0 | 0 | 0 |
| Midhurst | 0 | 0 | 0 | 0 | 0 |
| Parry Sound | 0 | 0 | 0 | 0 | 2,459 |
| Pembroke | 0 | 0 | 0 | 0 | 0 |
| Peterborough | 0 | 0 | 0 | 0 | 0 |
| Sub total | 264 | 1,242 | 10,177 | 31,094 | 22,757 |
| **Provincial total** | **441** | **1,242** | **10,309** | **31,094** | **39,476** |

In 2008, there were several municipal and county-led aerial spray foliage protection programs launched in an effort to reduce the cumulative effects of gypsy moth damage. The largest was implemented by Norfolk County. Spray programs also took place in the eastern portion of Aylmer, Guelph, and Aurora districts, including the municipalities of Hamilton, Oakville, Mississauga, and Burlington and the Mississaugas of New Credit. These programs used the bacterial insecticide *Bacillus thuringiensis* subspecies *kurstaki* (Btk). In addition to these foliage protection programs many private operations occurred throughout the Niagara Peninsula. While most used Btk, a few used the chemical insecticide Sevin® with carbaryl as the active ingredient.

A research project was also conducted in 2008 by the Canadian Forest Service (CFS-

Atlantic Forestry Centre) using Gypchek, a biological pesticide derived from the nucleopolyhedrosis virus (NPV). This project included Bronte Creek Provincial Park, Turkey Point Provincial Park, St. Williams Conservation Reserve and Pine Grove Municipal Forest in Norfolk County, all in Aylmer District. Partners in the project included OMNR, Forest Protection Ltd., Sylvar Technologies, and Norfolk County.

Results of the CFS research program were promising as surveys in June showed higher than normal NPV infections when compared to unsprayed areas of the same forests. The larval infections of NPV were, however, overshadowed as 100% of the larvae were also infected by the naturally occurring fungus, *Entomophaga maimaiga*. The fungus became prevalent in gypsy moth populations due to favorable weather conditions of damp and cool spring temperatures allowing for rapid development of the fungus. Similarly, other populations sampled across southern Ontario revealed high rates of larval mortality caused by the *Entomophaga maimaiga* fungus.

An additional CFS research project was conducted in Toronto to test the efficacy of treating gypsy moth eggs with Gypchek.



## **Early birch leaf edgeminer**, *Messa nana* (Klug)

This European insect was first found in Ontario in 1967, after its detection one year earlier in Maine and New York. In Canada, occasional localized outbreaks occur in Ontario and Quebec.

In 2008, detection of early birch leaf edgeminer was reported in Kemptville, Peterborough, Midhurst, Sudbury, and North Bay districts.

In Kemptville District, light defoliation occurred on 1.5 ha of white birch (*Betula papyrifera* Marsh.). Further west in Peterborough District, white birch in the Ganaraska Forest had light defoliation, which averaged less than 20%.

Similarly in Midhurst and North Bay districts, the early birch leaf edgeminer was detected at low levels in satellite pockets, including Line 8 North, Oro-Medonte Township, Midhurst District, and in Finlayson Point Provincial Park, near Temagami, North Bay District.

In Sudbury District this insect was detected in two separate locations feeding on white birch foliage: Serpent River rest stop along Hwy 17 near Webbwood, and on Kukagami Lake Road near Markstay. At the Serpent River rest stop, feeding was noted on 100% of the host species.

## **European pine sawfly**, *Neodiprion sertifer* (Geoff.)

First found in Canada in Ontario in 1939, this insect has spread throughout most of Ontario where it feeds on native and non-native pines (*Pinus* spp.).

This insect was detected in Peterborough and Aurora districts causing moderate-to-severe defoliation on Scots pine (*Pinus sylvestris* L.) and moderate-to-severe defoliation to eastern white pine in Midhurst District.

High populations in Peterborough District caused 100% defoliation to naturalized Scots pine in Otonabee, South Monaghan Township. Populations of European pine sawfly were also on the rise in Midhurst and Aurora districts. Moderate-to-severe defoliation occurred on Scots pine in Caledon, Peel Region, Aurora District, and on eastern white pine in the Millennium Tract, Simcoe County Forest, Midhurst District.

## **European fruit lecanium**, *Parthenolecanium corni* (Bouché)

This introduced pest feeds on a variety of hardwood species, notably oak (*Quercus* spp.), ash (*Fraxinus* spp.) and maple (*Acer* spp.). As a young scale, the European fruit lecanium sucks sap from host tree foliage and then migrates to the twigs where it continues to feed. The sap is typically low in nitrogen, but relatively high in sugar. Like other sap sucking insects, the scale exudes droplets of sugary sap (honeydew) in its quest for nutrients. Sooty mold commonly grows on the honeydew exuded by the insect, causing blackening of the surfaces on which the honeydew droplets land.

Since 2006, population levels have been high on sugar maple (*A. saccharum* Marsh) in the south-central portion of Parry Sound District. Scale populations produced considerable amounts of honeydew which were noticeable on understory leaves and other surfaces. Sooty mold on the honeydew resulted in blackening of the foliage, twigs and bark of host trees. The presence of this high scale population for three consecutive years has caused some twig mortality on sugar maple.

## **Imported willow leaf beetle**, *Plagiodera versicolora* (Laich.)

The imported willow leaf beetle was introduced to North America in 1915 and now has a wide distribution. The feeding of the iridescent blue adult beetles creates holes in foliage, while the larvae skeletonize both sides of the leaves. Heavily infested trees become brown as early as mid-June.

This year, severe defoliation was reported on willows (*Salix* spp.) along riparian areas near Cayuga, Aylmer District; Belfountain, Aurora District; and Kirkfield, Peterborough District, Southern Region; and at New Liskeard, North Bay District, Northeast Region.

## **Banded elm bark beetle**, *Scolytus schevyrewi* (Semenov)

The banded elm bark beetle (BEBB) is an invasive insect indigenous to several Asian countries from China to Russia. Host species within its native range include elm (*Ulmus* spp.), weeping willow (*Salix alba* L.), Russian olive (*Elaeagnus angustifolia* L.) and some fruit-producing members of the rose family (Rosaceae). To date it is only known to attack elm trees in North America.

As part of the United States Department of Agriculture (USDA) Early Detection/Rapid Response Survey, BEBB was detected in 12 U.S. states in 2003. By 2004, BEBB had been found in 18 states. These states included Montana, Minnesota and Michigan, which have a common border with Canadian provinces and pose as a point of entry into Canada.

These multiple collections of adult beetles indicate that this species has been well established in North America for several years. In 2006, BEBB was incidentally captured on an elm bark beetle trap in Medicine Hat, Alberta, as part of that provinces' Dutch elm disease (*Ophiostoma ulmi* and *O. novo-ulmi*) monitoring program.

On behalf of the Canadian Food Inspection Agency (CFIA), the CFS-OMNR forest health monitoring program conducted a trapping survey in an effort to determine if BEBB was present in Ontario in 2007. A detection survey using 12-unit "wet" Lindgren funnel traps baited with a single 2-methyl-3-buten-2-ol lure was conducted. Traps were deployed, monitored and serviced at 35 sites in two "at risk areas" within the province. The two areas monitored were the south west portion of Fort Frances District, Northwest Region, and the south west portion of Aylmer District, Southern Region. These areas were selected due to the high population of host trees, their proximity to a known infested U.S. State, and high traffic border crossings.

While no BEBB were captured in the 2007 survey, the CFIA did collect BEBB in Toronto as part of a separate monitoring program for invasive species. This pest remains unregulated in Canada based on the widespread distribution of BEBB in the U.S and confirmation of the pest in four Canadian provinces (Alberta, Manitoba, Ontario and Saskatchewan). Targeted surveys for the banded elm bark beetle were not repeated in 2008, and the insect was not detected in 2008 as part of regular forest health monitoring.

## **European woodwasp**, *Sirex noctilio* Fabricus

A native of Europe, this woodwasp has been introduced to many countries in the southern hemisphere where pine species have been imported and planted, including New Zealand, Australia, South Africa, Brazil, and Argentina. While a single female *Sirex noctilio* woodwasp was first collected in New York in 2004, the source or timing of its introduction to North America is not known.

After New York reported the discovery of a well established population near Oswego, NY in 2005, OMNR and CFS conducted an initial trapping survey in August that found the insect near Prescott and at Sandbanks Provincial Park. The Canadian Food Inspection Agency (CFIA) also found the insect near Uxbridge (Aurora District) and Cambridge (Guelph District). With financial support to OMNR from the CFIA, a follow-up survey in 2006 by the OMNR-CFS forest health monitoring program found the insect to be widespread across much of southern Ontario. Subsequent surveys have been conducted to delineate the range of the insect in Ontario, again with the financial support of the CFIA.

As a result of these previous surveys, *S. noctilio* had been detected in 25 jurisdictions: the counties of Hastings, Nipissing, Bruce, Dufferin, Durham, Elgin, Grey, Norfolk, Huron, Kent, Lambton, Leeds & Grenville, Middlesex, Niagara, Northumberland, Peterborough, Prince

Edward, Simcoe, Waterloo, and Wellington. Detections were also made in the Township of Tehkummah on Manitoulin Island and in the regional municipalities of Halton, Muskoka, Peel, and York.

The focus of the 2008 survey was to determine the northern extent of *S. noctilio* populations in Ontario. It consisted of a 14 week trapping period. Collections began the first week of July and ended on the second week of October. Trapping sites were established in unmanaged, over-stocked pine stands with low levels of stress. These pine stands were located along Hwy. 69 from Parry Sound north to Sudbury; east and west along Hwy. 17 from Chalk River to Sault Ste. Marie; north on Hwy. 144 to Halfway Lake Provincial Park; north on Hwy. 108 to Mississaugi Provincial Park; north on Hwy. 129 towards Aubrey Falls Provincial Park; and from Powassan to just north of Kirkland Lake (Figure 3.10).

At each location, two 12-Unit Lindgren traps were hung 30 m apart, 2m above ground, and baited with an ultra high release (UHR) lure containing 70% alpha-pinene (75% of the + isomer and 25% of the - isomer) and 30% beta-pinene (95% of the -isomer).

In 2008, a total of 433 siricids were captured from 107 of the 125 trapping sites in Ontario. There were eight species of siricids identified; however none of them were *Sirex noctilio*. Thus no European woodwasp were detected in this survey this year (Table 3.3), and there was no expansion to the known range of this insect.

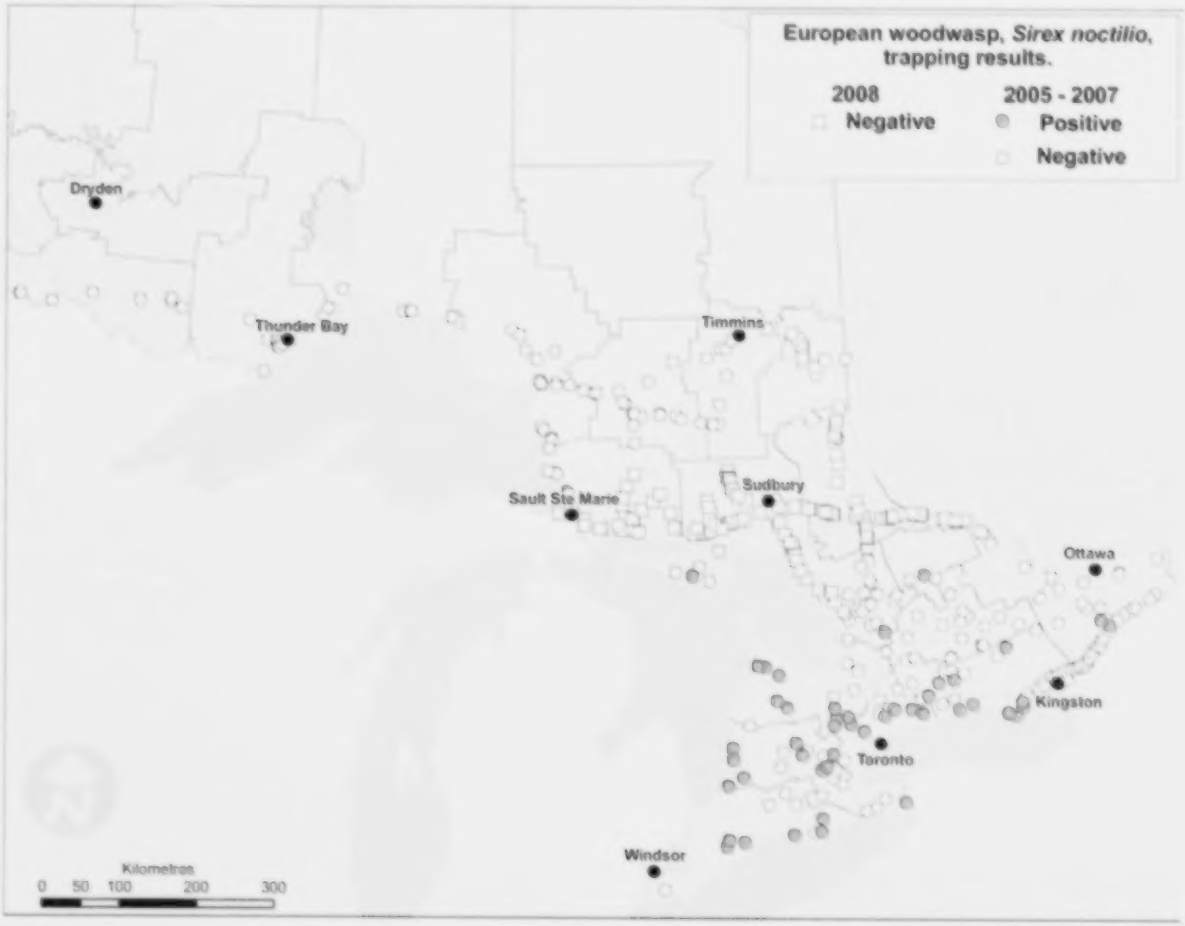



**Figure 3.10** Known distribution of European woodwasp, *Sirex noctilio* and trapping locations in 2008.

Negative trap captures for *S. noctilio* however do not necessarily indicate that populations do not exist at the trapping site. While the trap and lure method currently used in Canada and the US is known to catch *S. noctilio*, the trapping method is not considered to be highly attractive or effective at catching this species. For example, no *S. noctilio* were caught in 2007 at Sandbanks Provincial Park even though adult *S. noctilio* could be seen flying in the area (P. de Groot, CFS, personal communication) and the insect had been caught at the same site one year earlier. Also the wet weather of 2008 may have favoured tree growth and health at the expense of *S. noctilio*. The insect's population or activity level may have been further reduced by periods of hail, overcast skies and cooler temperatures.

Table 3.3 Summary of total number of Siricids collected by species, number of sites represented, and date of first and last captures in 2008.

| Insect Name | Total Number of Specimens | Number of Sites (n=125) | Date first capture | Date Last capture |
|---|---|---|---|---|
| *Sirex cyaneus* | 1 | 1 | August 19 | August 19 |
| *Sirex edwardsii* | 23 | 19 | August 8 | October 4 |
| *Sirex nigricornis* | 149 | 47 | August 23 | October 5 |
| *Sirex nr. juvencus* | 13 | 10 | August 23 | September 12 |
| *Tremex columba* | 1 | 1 | September 8 | September 8 |
| *Urocerus albicornis* | 15 | 13 | July 8 | September 4 |
| *Urocerus cressoni* | 228 | 87 | July 8 | October 4 |
| *Xeris spectrum spectrum* | 3 | 3 | July 9 | July 24 |
| *Sirex noctilio* | 0 | 0 | --- | --- |

## Pine shoot beetle, *Tomicus piniperda* (L.)

The pine shoot beetle (PSB) is native to Europe, North Africa and Asia. Introduced to North America, the first discovery of this insect was in Ohio in 1992 followed shortly thereafter by its detection in Ontario in 1993.

Detection surveys in Ontario have since confirmed PSB populations across Southern Region and federal quarantines have been placed on the movement of pine material from regulated areas to slow the spread of this pest of all pines (CFIA website: http://www.inspection.gc.ca/english/plaveg/pestrava/tompin/tompine.shtml). Trace population levels have been detected along the southern edge of the contiguous forest areas of Northeast Region, specifically near Iron Bridge, Blind River, North Bay and Sturgeon Falls.

When first discovered in North America, PSB was thought to be a relatively benign pest of Scots pine. By 1998, it was determined that under favourable weather conditions, stand composition and site characteristics, this bark beetle can cause significant pine tree mortality. It also has an affinity for the hard pines, which include Scots, jack, and

red pine. Shoot damage is often severe on eastern white pine when growing in close proximity to other infested pines. Were PSB to spread to the contiguous forested areas of Ontario, it is not known whether this insect could exacerbate the effects of drought, forest fires, or outbreaks of other insects such as pine false webworm or jack pine budworm (*Choristoneura pinus pinus* Free.).

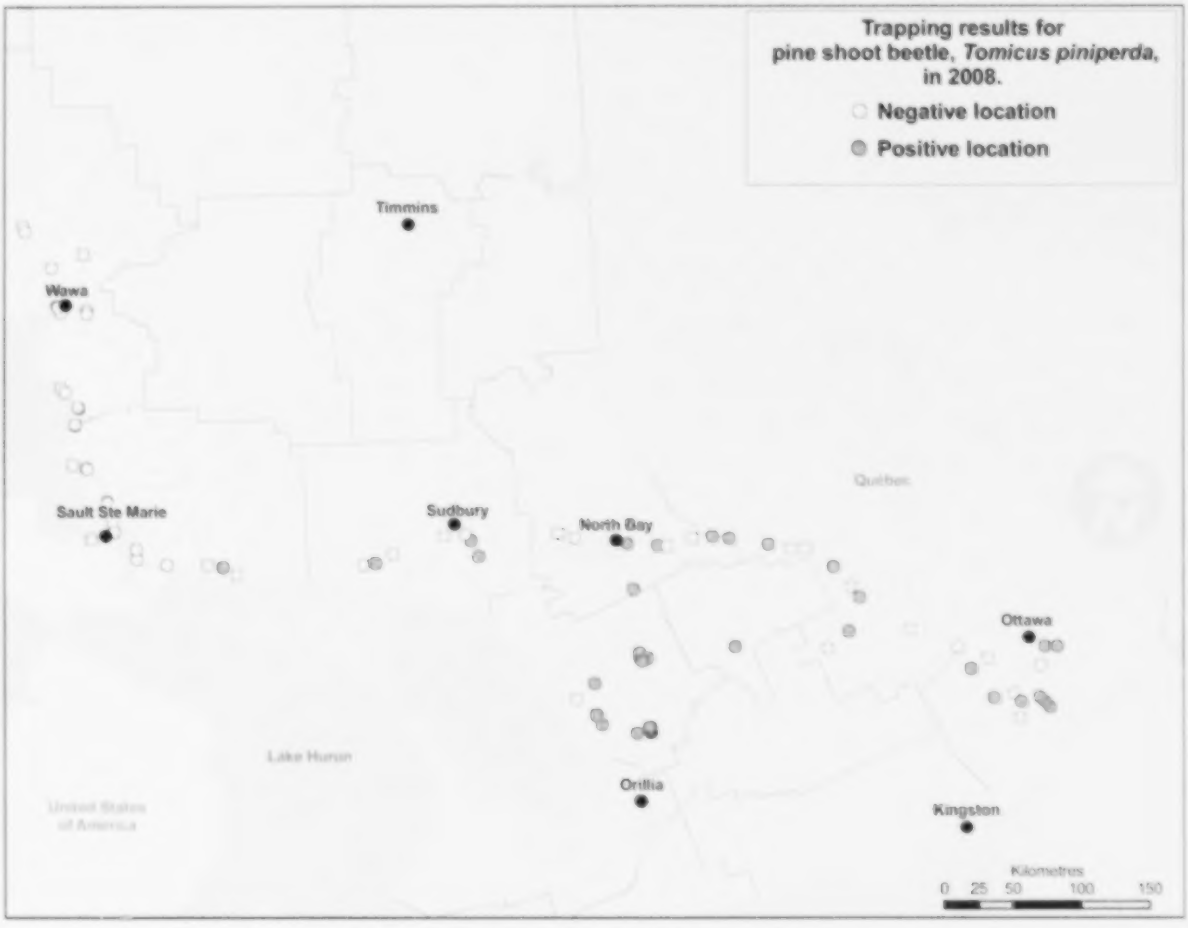



Figure 3.11 Trapping results for pine shoot beetle in Ontario, 2008.

In 2008, the annual delineation survey deployed individual Lindgren funnel traps baited with alpha-pinene at 93 sites along three main highway arteries in the province.

One area was north of Bracebridge, Parry Sound District where OMNR began an annual containment program using bait logs in 2001. In this area 38 pine stands of various species (Scots pine (*Pinus sylvestris* L.), red pine (*P. resinosa* Ait.), jack pine (*P. banksiana* Lamb.), or eastern white pine (*P. strobus* L.)) were used as trap locations. Results for 2008 indicate that pine shoot beetle adults were collected (Figure 3.11) at all locations.

At the second area, and for the second consecutive year, traps were placed in 26 pine stands north of Sault Ste. Marie along Hwy. 17 to White River. Here, no pine shoot beetles were captured in 2007 or 2008.

The third area of delineation in 2008 was along the Hwy. 17 corridor from North Bay east to Ottawa and south and east on Hwy. 416 and Hwy. 417. Throughout this area, 29 pine stands were monitored using Lindgren funnel traps. Adult pine shoot beetles were collected and positively identified at 16 of these 29 locations in 2008. These new finds for PSB were: within the city limits of North Bay, in the townships of Bonnfield, and Papineau and Cameron, as well as in the south central part of Algonquin Park. Further east, positive trap catches also occurred in Renfrew County in Head, Clara and Maria, North Algona and Wilberforce townships. To the south, Lanark County had positive trap catches in Beckwith and Ramsay townships. Leeds and Grenville County had positive traps in North Grenville Township. The remaining positive locations were all within the limits of the Greater City of Ottawa.

Shoot damage caused by PSB maturation feeding varied considerably across Southern Region. The most damage recorded was moderate shoot damage (35-50%) around the towns of Bracebridge, Parry Sound District and Bancroft, Bancroft District.

In addition to the detection program, the Ontario Ministry of Natural Resources Forest Health Unit conducted a PSB Containment Program. All sites selected for the containment project were concentrated around the initial discovery of a high population of PSB near Bracebridge, as well extending north to sites to Espanola, Sudbury District and Iron Bridge, Sault Ste. Marie District. The Containment Program in 2008 consisted of deploying three to five pine trap logs, 1 m in length, at 25 locations where adult PSB were captured in Lindgren traps in 2007. These trap-logs were later collected and an area of bark was removed to examine the log for evidence of pine shoot beetle galleries.

Further visual ground surveys at the 25 sites were conducted in September at the end of the shoot feeding period. The ground surveys showed a slight increase in shoot damage in tree crowns at sites where beetles were captured in trap logs.

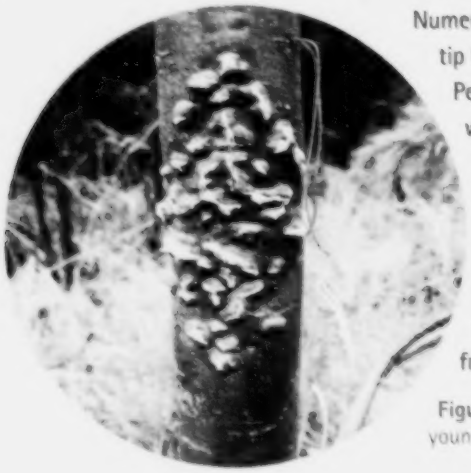
In general, surveys for PSB, whether part of the initial delineation or part of the containment program help determine the full extent of the PSB population and impact on Ontario's forest resource.



## FOREST DISEASES

### White pine blister rust, *Cronartium ribicola* J.C. Fisch.

Introduced to North America around 1900, white pine blister rust is the most serious disease of eastern white pine. The disease is caused by the introduced fungus, *Cronartium ribicola* J.C. Fisch, that requires two hosts (eastern white pine, and either currants [*Ribes* spp.]. The blister rust fungus is capable of infecting and killing white pine of all ages. The disease kills the tree by cutting off the flow of nutrients and girdling the main stem (Figure 3.12). Planting or regenerating white pine in Ontario often fails where site conditions or geographic location promote high humidity, restricted airflow, or cool sinking air which favour infection by the fungus.



Numerous new infections were observed in the form of branch tip flagging and stem discolouration across the Kemptville and Pembroke districts in 2008. The heaviest damage (5-10%) was recorded on young eastern white pine regeneration in the heavier concentrations of pine in Limerick Forest and La Rose Forest, Kemptville District.

Areas of Ontario that experienced a cool wet late summer and fall may experience a heavier level of white pine blister rust infection in 2009 due to extremely heavy fruiting occurring on the alternate host.

**Figure 3.12** Orange-coloured fruiting bodies on main bole of a young eastern white pine (photo by R. Wilson).

## **Diplodia tip blight**, *Sphaeropsis sapinea* (Fr.) Dyko & B. Sutton

The presence of diplodia tip blight results in stunted growth and browning of new needles. This is commonly followed by mortality of current year shoots and second year cones. Heavy black fruiting in late summer can often be observed on needles or cones. While shoot and branch mortality is common, whole tree mortality can occur when bark beetles attack trees weakened by the disease.

This disease is distributed throughout Ontario. In 2008 it was recorded in Pembroke, Kemptville and Peterborough districts where understory red pine and roadside Scots pine (*Pinus sylvestris* L.) and Mugho pine (*P. mugo* Turra) were the affected hosts. For the past two years, understory red pine in Pembroke District showed light levels of tip mortality and second-year cone and branch mortality throughout the Petawawa Research Forest (formerly Petawawa National Forest Institute) and in partial-cut areas in Raglan Township. In this area infection levels were down in the 1 ha stand from 20% affected in 2007 to 3% in 2008. Light levels of tip mortality were also noted on roadside Scots and Mugho pines in both Kemptville and Pembroke districts.

In Peterborough District, diplodia tip blight was recorded in managed forests of Lennox and Hastings County on understory red pine regeneration of heights less than 1 m tall.

## **Dutch elm disease**, *Ophiostoma novo-ulmi* Brasier

Dutch elm disease (DED) was first identified in The Netherlands in 1921, giving Dutch elm disease its name. The disease was introduced to North America in 1928 by way of imported lumber and has devastated populations of elms since. In Ontario, DED continues to be a plight of juvenile elm (*Ulmus* spp.) trees and the occasional mature elm tree that have survived earlier onslaughts of the disease. The major cause for the spread of the fungus is the elm bark beetle (*Hylurgopinus rufipes* (Eich.)), and the European elm bark beetle (*Scolytus multistriatus* (Marsh)). The newly-detected banded elm bark beetle (*Scolytus schevyrewi* (Semenov)) is also known to carry the disease. All of these vectors

feed on elm trees and carry spores of the disease from tree to tree. The fungus can also spread through root grafts.

Observations over the last several years suggest an increase in virulence of the disease. Whereas previously trees showing yellow flagging of a branch would eventually die over the next year or more, some trees appear to be dying within one month of the appearance of yellow flagging of the leaves.

Reports of DED were common in Sudbury District in 2008 as elm trees throughout the district showed progressive signs of the disease such as wilting and the curling of leaves. Similarly, Midhurst, Aurora, Pembroke and Kemptville districts showed high presence of the disease on juvenile-aged trees. In Peterborough and Bancroft districts significant tree mortality was reported on juvenile as well as mature elms throughout the area.

## **Butternut canker**, *Sirococcus clavigignenti-juglandacearum* V.M.G. Nair, Kostichka & Kuntz

Butternut canker is a deadly disease that is threatening the existence of butternut (*Juglans cinerea* L.) trees in North America. The disease is caused by the fungus *Sirococcus clavigignenti-juglandacearum* Nair, Kostichka & Kuntz. It forms elongated cankers (Figure 3.13) on the branches and the tree bole, eventually girdling and killing the tree. Trees of all sizes and ages are affected. The disease is of an unknown origin, but it is thought to have been introduced to North America. In 2005, butternut was listed as an endangered species in Canada.

Tree damage was first noted in Wisconsin in 1967, but it was not until 1979 that the fungus was described as a new species. In 1991, it was reported that tree cankers, decline and mortality were occurring in southwestern Ontario. The first confirmation of butternut canker was from a tree in Ipperwash Provincial Park. Dendrochronology on butternut indicated the disease may have been affecting trees in Ontario at least 18 years earlier.

Figure 3.13 Canker formed on bole of tree due to infection by butternut canker (photo by R. Wilson).

Between 1989 and 1995, a total of 75 locations across the range of butternut in Ontario were examined by the CFS for the presence of butternut canker and associated effects the disease was having on the host. The disease was found at 55 of the 75 locations (Figure 3.14). Reports from that period indicate that the disease was widespread throughout the range of butternut, and branch and tree mortality were common. For example, field observations during that period showed that:

- Infections were evident from the symptomatic sooty bark patches, presence of branch cankers and large stem cankers that had not developed callus tissue.
- In 1991, branch mortality ranged from 20-80% on trees 13-17 m tall at five sites in southwestern Ontario.

- In 1992, in Ashfield and McKillop Townships, Guelph District, 8 of 30 trees were recorded as killed by the canker. In the eastern portion of Southern Region, >90% of the trees examined were affected by the disease. Although no tree mortality was observed, branch mortality ranged from 20-95%.
- In 1993, the most severe damage was recorded in Erin Township, Guelph District, where two of the three trees examined had 95% branch mortality. Elsewhere branch dieback ranged from 10-90% on trees 7.5-18.9 m in height.

In 2008, a provincial survey established 60 permanent butternut monitoring sites on public lands (Figure 3.14). The objectives of the survey were to 1) refine the distribution of butternut canker within Ontario; 2) estimate the frequency of canker infection and mortality in Ontario; 3) assess the incidence and severity of butternut canker; and 4) determine the health of butternut regenerating from seedlings or stump sprouts.

Butternut canker was found at all sites surveyed. Preliminary analysis of the data found that only 75 of the 1,392 trees that were assessed were considered healthy (i.e. infected, but still alive and growing). At least one healthy butternut tree was located at 17 of the 60 sites surveyed.

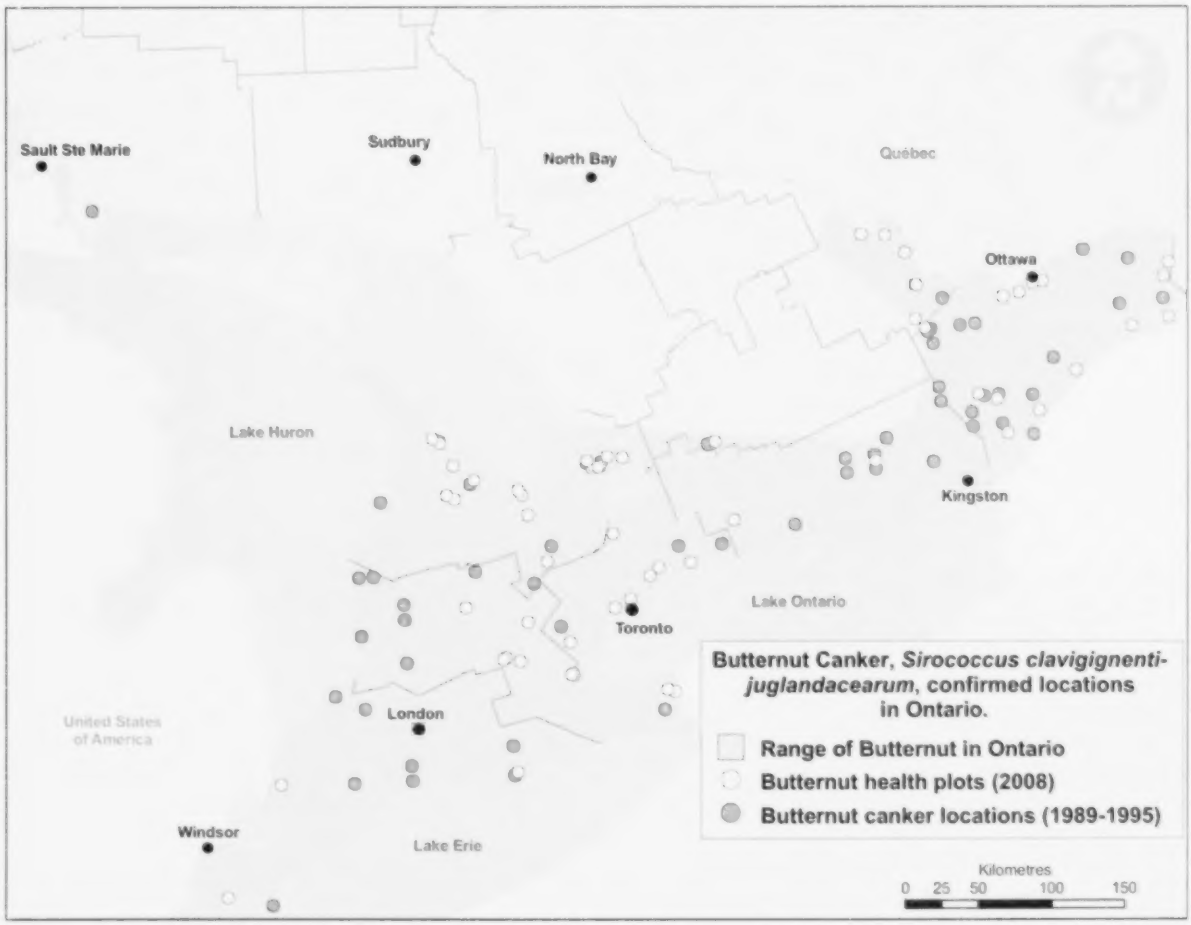



Figure 3.14 Range of butternut in Ontario, butternut health plots in Ontario (2008 survey) and confirmed locations of butternut canker (1989-1995).

# Northwest Region

**L. Rowlinson[1], M. Francis[1], and B. Smith[2]**

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## FOREST INSECTS

### Alder dagger moth, *Acronicta dactylina* Grt.

This defoliator is known to feed on alder (*Alnus* spp.), white birch (*Betula papyrifera* Marsh.) and willow (*Salix* spp.). It ranges from Newfoundland and Labrador to Alberta in Canada, and down into the northern United States.

Several mature dagger moth larvae were found on speckled alder (*Alnus incana* ssp. *rugosa* (Du Roi) J. Clausen) causing light-to-moderate defoliation. Larvae were collected from understory trees during a jack pine (*Pinus banksiana* Lamb.) plantation survey near Lukinto Lake west of Long Lac in Nipigon District in 2008 (Figure 4.1).

**Figure 4.1** Alder dagger moth larva on alder near Lukinto Lake (photo by M. Francis).

### Bronze birch borer, *Agrilus anxius* Gory

The bronze birch borer is the most destructive pest of birch in North America. It prefers stressed, weakened birch, including ornamentals, although it will occasionally attack healthy trees.

This wood borer (Figure 4.2) has also been causing white birch mortality within the city of Thunder Bay for the last several years and is slowly spreading east and west of the city to areas of stressed white birch.

Figure 4.2 Bronze birch borer larva on white birch in Thunder Bay District (photo by M. Francis).

Top and whole-tree mortality of white birch was recorded between Thunder Bay and Nipigon along the Hwy. 11/17 corridor in 2008. A total of 240 ha of mortality was delineated through ground and aerial reconnaissance. Damage was recorded on 135 ha in Thunder Bay District and 94 ha in Nipigon District (Figure 4.3). The majority of the mortality was observed on young to semi-mature white birch trees.



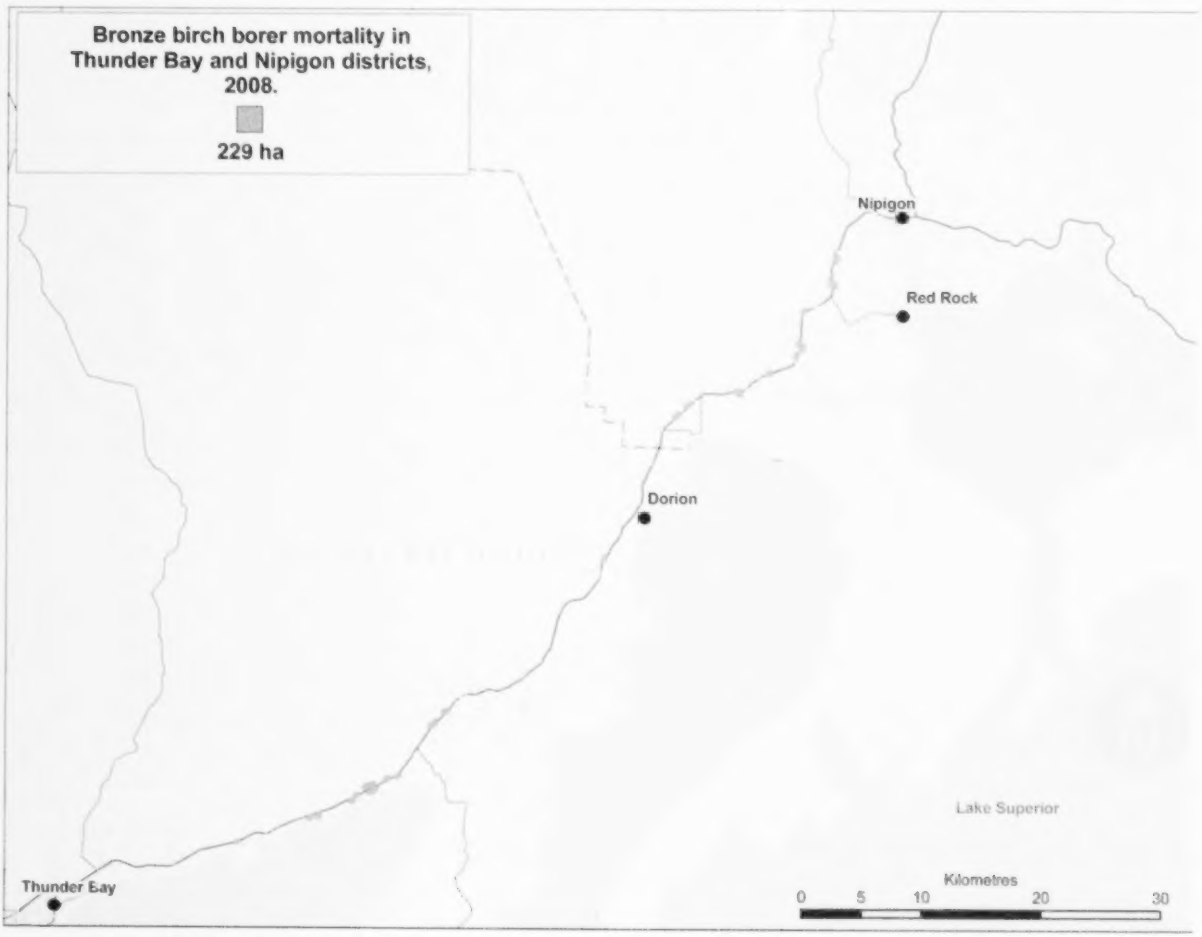



Figure 4.3 Bronze birch borer mortality in Thunder Bay and Nipigon districts 2008.

## **Bronze poplar borer**, *Agrilus liragus* B.&B.

The bronze poplar borer continues to cause damage in Nipigon and Thunder Bay districts, particularly along the Hwy. 11/17 corridor between Thunder Bay and Nipigon. Populations have also been recorded in Ledger Township, Nipigon District.

Damage is most evident on balsam poplar (*P. balsamifera* L.). Branches in the upper crown are attacked first, and then populations move onto the main stem. As the attack progresses, epicormic shoots develop at the base of dying balsam poplar trees.

Lower populations of the bronze poplar borer were recorded on trembling aspen (*P. tremuloides* Michx.), compared to balsam poplar, but characteristic damage in the form of larval tunnels and branch mortality was found on this host as well.



## **Fall cankerworm**, *Alsophila pometaria* (Harr.)

The fall cankerworm (Figure 4.4) is a common pest that occasionally occurs in large numbers throughout its native range in Canada (Nova Scotia to Alberta).

This defoliator of many hardwood tree species was observed causing varying levels of defoliation within the towns of Fort Frances and Kenora. The insect was found feeding on all age classes of Manitoba maple, (*Acer negundo* L.), ash, (*Fraxinus* spp.), basswood, (*Tilia americana* L.), and cherry (*Prunus* spp.) trees. The heaviest defoliation (100%) was recorded on Manitoba maple. This insect was also reported by cottage owners on the north end of Lake of the Woods.

Figure 4.4 – Fall cankerworm larva on linden foliage (photo by L. Rowlinson).

## **Uglynest caterpillar**, *Archips cerasivorana* (Fitch)

Low levels of this pest were observed eating the leaves of chokecherry (*Prunus virginiana* L. var *virginiana*) trees in the Limestone Lake area of Nipigon District in 2008 (Figure 4.5). Only three trees were observed to be affected, but damage was heavy. Overall, levels of defoliation by uglynest caterpillar were down in 2008 as nests were not found along Hwy. 61 and Hwy. 130 south of Thunder Bay where it had been recorded for the previous two years.

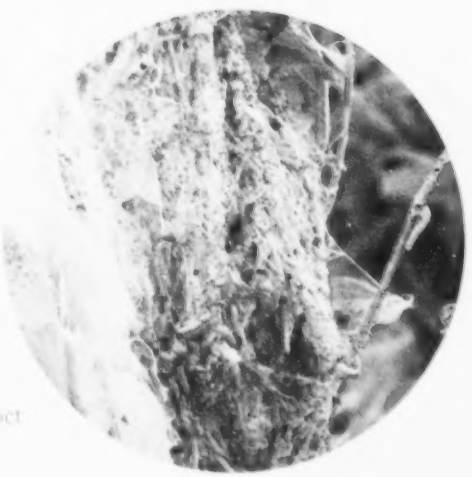


Figure 4.5 – Uglynest caterpillar on chokecherry, Nipigon District (photo by M. Francis).

## **Large boxelder leafroller**, *Archips negundana* (Dyar)

The large boxelder leafroller, a pest of Manitoba maple, had been defoliating street and ornamental trees throughout the towns of Fort Frances, Kenora and Dryden since 2005. In 2008 however, populations of this insect collapsed in the towns of Fort Frances and Kenora but remained present in Dryden at reduced levels. Defoliation on host trees in the town of Dryden ranged between 25% and 40%.

New populations were recorded for the first time in the town of Sioux Lookout. In many cases this insect completely denuded host trees of all foliage; on average defoliation levels ranged between 50 and 100%.



## **Eastern larch beetle**, *Dendroctonus simplex* LeC.

Mortality of tamarack (*Larix laricina* (Du Roi) K. Koch) trees was observed in the village of Roslyn as well as along Hwy. 527 in the Onion Lake area, Thunder Bay District.

Dark brown boring dust was observed covering the lower part of the main stem while investigating the cause of the tree mortality. Eastern larch beetle larvae and adult beetles were both found under the bark of affected trees.

Attack by the eastern larch beetle may have been precipitated by drought conditions experienced in the region in 2006 and 2007.

## **Eastern pine shoot borer**, *Eucosma gloriola* Heinr.

Figure 4.6 Eastern pine shoot borer damage, Nipigon District (photo by M. Francis).

Damage by this insect is caused by the larvae of the moths as they bore in the pith of the shoots. The shoots then break easily, especially if the tree top is shaken. The characteristic damage in the form of hinged shoots (Figure 4.6) is commonly confused with white pine weevil (*Pissodes strobi* [Peck]) injury. As with white pine weevil, damage is common in plantations of pine species (*Pinus* spp.) particularly prior to crown closure.

Plantation surveys in 2008 found damage by pine shoot borer in Sioux Lookout, Dryden, Red Lake, Nipigon, and Thunder Bay districts.

In Northwest Region, damage in 2008 was predominantly recorded on lateral branches, with the overall damage on each tree generally at low levels (one branch/tree). The most significant damage by this pest in the region was in the Lukinto Lake area, Nipigon District with 19% of the jack pine host trees infested. At Kakabeka Falls, Thunder Bay District only 5% of the trees surveyed in a jack pine clonal orchard were infested.

## **Fall webworm**, *Hyphantria cunea* (Drury)

Fall webworm has been abundant in many areas of the province for the last few years. Tents made by this insect envelope the ends of the tree branches like a shroud. When numerous, they can cover the entire tree.

In 2008, fall webworm defoliation was recorded on alder, white birch, cherry, and willow trees throughout Nipigon, Thunder Bay, Fort Frances, Kenora and Sioux Lookout districts (Figure 4.7). Most of the defoliation was recorded on young, forest edge and roadside trees that were scattered throughout the region. As a result, damage caused by this insect was minimal.

Figure 4.7 Fall webworm larva (photo by L. Rowlinson).



## **Poplar leafblotch miners**, *Phyllonorycter ontario* (Free.) and *P. nipigon* (Free.)

In mid-August, poplar trees throughout Thunder Bay, Nipigon and southern Fort Frances districts appeared to have premature fall coloration. Ground checks revealed the aspen leafblotch miner, *Phyllonorycter ontario* (Free.) (Figure 4.8), on trembling aspen and balsam poplar leafblotch miner, *P. nipigon* (Free.), on balsam poplar.

In Fort Frances District, damage was concentrated in the southern portion of the district from the junction of Hwy. 11 and Hwy. 11B to Atikokan and west to Flanders Rd. Trees within this area sustained defoliation levels of <25% to >50%. The highest damage levels were recorded on forest edge and roadside trees less than four metres tall. Similar patterns of defoliation were recorded in Thunder Bay and Nipigon districts.

Figure 4.8 Aspen leafblotch miner damage on trembling aspen (Photo by M. Frances).

### Poplar decline and mortality

For the past 5 years, decline and tree mortality of trembling aspen and balsam poplar have occurred in Thunder Bay and Nipigon districts (Figure 4.9). In 2008, this damage was aerially mapped and covered a total area of 1,869 ha (Figure 4.10).

All sizes and age classes were affected to some degree. Some mixed poplar stands have over 40% mortality. The majority of the decline and mortality (1,561 ha) was in Ledger Township, Cameron Falls and the Helen Lake area, Nipigon District. The Helen Lake area has rocky, shallow soil areas that make aspen more susceptible to drought conditions. Smaller pockets of tree mortality were also recorded along the Hwy. 11/17 corridor between Thunder Bay and Nipigon, Thunder Bay District (308 ha).

Figure 4.9 Poplar decline near Cameron Falls, Nipigon District (photo by M. Francis).

While the cooler temperatures and above normal precipitation that prevailed in 2008 likely favoured tree growth, the previous several years were quite stressful to the trees.

Stress factors which contributed to tree decline and mortality included the forest tent caterpillar (1999-2004), bronze poplar borer (2004-2008), poplar borer (*Saperda calcarata* Say) (2004-2008), aspen leafblotch miner (2004-2008) and aspen leafroller (*Pseudexentera oregonana* (Wlsm.)) (2006-2007), armillaria root rot (*Armillaria* spp), septoria leaf spot (*Mycosphaerella populorum* G.E. Thomps.), hypoxylon canker (*Hypoxylon mammatum* (Wahlenb.) P. Karst., shoot blight of aspen (*Venturia macularis* (Fr.:Fr.) E. Mull & Arx), as well as drought-like conditions (2006 and 2007).

Figure 4.10 Areas of poplar decline and mortality, Thunder Bay and Nipigon districts 2008.

## White-spotted sawyer beetle, *Monochamus scutellatus scutellatus* (Say)

White-spotted sawyer beetle damage was observed across the Northwest Region in 2008. A total of 3,691 ha were delineated in the region (Figure 4.11). The damage was typical of this pest with jack pine and eastern white pine trees growing adjacent to recent burns, blowdowns or logging operations being the target of this wood borer in 2008.

Thunder Bay and Nipigon districts had small areas of jack pine mortality caused by white-spotted sawyer beetle. The majority of the mortality in Thunder Bay District was in the central and northern portions of the district in small pockets totalling 760 ha. These pockets of mortality were close to Wabang Lake in the central portion of the district and, in the northern portion of the district, jack pine mortality was recorded at the north east end of Caribou Lake and south of Smoothrock Lake. In Nipigon District, dead jack pine trees were seen in a small pocket (98 ha) in the southwest portion of the district on the northwest side of Long Lake.

Aerial surveys conducted in the southeast portion of Fort Frances District revealed several pockets of dead and dying eastern white pine trees. Ground checks revealed large numbers

Figure 4.11 Areas-within-which white-spotted sawyer beetle caused mortality of jack pine in Ontario, 2008

of white-spotted sawyer beetle larvae under the bark of these pine trees. The damage occurred along the Ontario-Minnesota border in the southeast corner of Quetico Provincial Park, immediately adjacent to a large burn that occurred in Minnesota a few years earlier. The total area of this damage was 2,116 ha and extended from Argo Lake eastward to Silver Falls located approximately 1.5 km west of the Thunder Bay-Fort Frances district boundary.

This beetle was also recorded in the southeast portion of Dryden District causing jack pine mortality along the edges of areas of blowdown and large cutovers.

## **White pine weevil**, *Pissodes strobi* Peck

While eastern white pine is the most common host of this pest in Ontario, jack pine is a close second in attack frequency, with other species of pine and spruces (*Picea* spp.) also susceptible to this shoot insect.

In 2008, low levels of this insect were noted during surveys in jack pine and black spruce (*Picea mariana* (Mill.) BSP) plantations in Nipigon, Thunder Bay and Sioux Lookout districts.

**Figure 4.12** White pine weevil damage, Thunder Bay District (photo by M. Francis).

In late summer, jack pine trees in young plantations in all three districts exhibited the typical symptoms of white pine weevil damage. Main leaders were withered, brown and had the characteristic shape of a shepherd's crook (Figure 4.12). Damage was most common in jack pine plantations, but overall fewer than 5% of the trees were affected.

Damage in the Kreikmann black spruce seedling seed orchard southwest of Kakabeka Falls, Thunder Bay District, was less than 1%. Similarly a young black spruce seedling seed orchard near Dragonfly Lake, northwest of Beardmore, Nipigon District had only very low levels of damage (1%) by this pest in 2008.

## **Aspen leafroller**, *Pseudexentera oregonana* (Wlsm.)

In 2007, this insect was suspected to be causing defoliation of aspen trees in scattered areas of northwestern Ontario. Confirmation of this infestation came during the spring of 2008. Cool, damp conditions slowed insect development and as a result samples were obtained and identification confirmed that the aspen leafroller was responsible.

During 2008, the aspen leafroller attacked aspen trees in widely distributed sites across Fort Frances, Kenora and Red Lake districts with moderate-to-severe defoliation totalling 17,030 ha (Figure 4.13).

Defoliation in Fort Frances District was found along the western boundary of Dewart, Sifton, Kingsford, and Emo townships on the west side of the town of Fort Frances. To

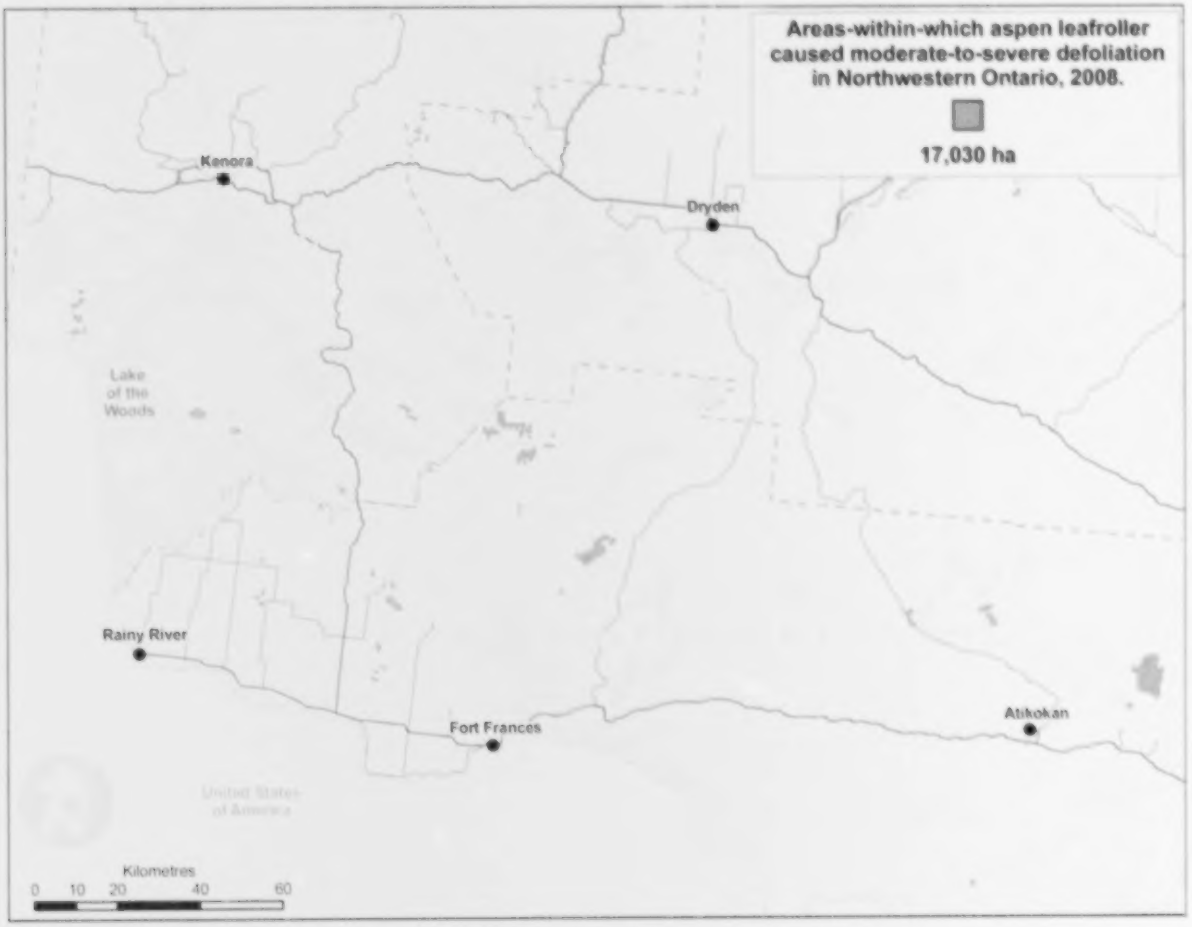



Figure 4.13 Areas-within-which aspen leafroller caused moderate-to-severe defoliation in Northwestern Ontario, 2008.

the north, defoliation was mapped along Strong, Vista, Straw, Lawrence and Rowan lakes. To the east, pockets of moderate-to-severe defoliation were mapped in Ramsay/Wright, Hutchinson and Atikokan townships as well as to the north of the Town of Atikokan along Clearwater West Lake and Crowrock Lake. Total area defoliated in Fort Frances District was 14,123 ha.

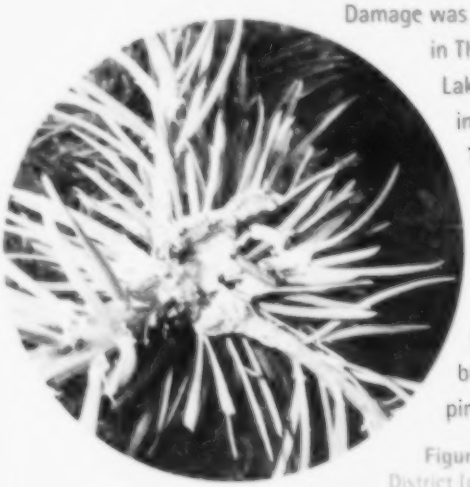
In Kenora District, defoliated areas totalled 2,331 ha with infestations being mapped on several islands in Lake of the Woods as well as on the mainland, west of Hwy. 71, in the vicinity of Flint and Stephen lakes.

The pocket of defoliation mapped in Red Lake District was on the southern end of Gull Lake on the boundary with Sioux Lookout District. The total area of moderate-to-severe defoliation was recorded at 576 ha.

## Pitch nodule maker, *Retinia albicapitana* (Bsk.)

The pitch nodule maker was commonly observed during jack pine plantation surveys in 2008. The female moth lays her eggs on new shoots from May to July. When the eggs

hatch, the new larvae construct a nodule of pitch where they will overwinter. The following spring the larvae emerge and feed on the bark and wood while constructing a second nodule beside the first where it will overwinter again (Figure 4.14). The following spring the mature larvae will pupate in the nodule.



Damage was recorded in plantations in Kakabeka Falls on younger jack pine in Thunder Bay District, as well as in a plantation near Lukinto Lake, Nipigon District. The pitch nodule maker was more common in the plantation in Nipigon District than the plantation in Thunder Bay District; however, at both plantations, the level of infestation on any tree was relatively low with typically only one branch affected. Evaluation of a sample of 150 jack pine trees surveyed near Lukinto Lake determined 23.3% of the trees to be infested. Only 2.7% of the trees had more than one branch affected, but still at a moderate level (2-4 branches). In the Kakabeka Falls plantation, only three jack pine trees were infested (2%) and only at low levels.

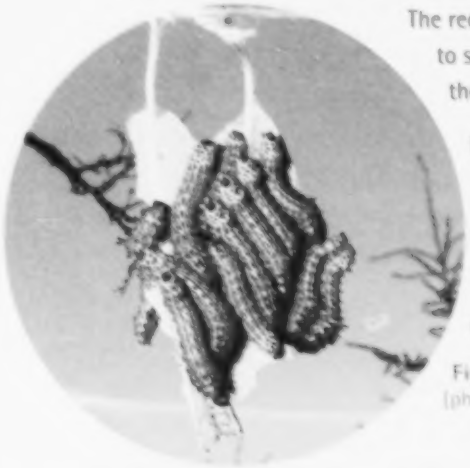
**Figure 4.14** Pitch nodule maker larva near Lukinto Lake area, Nipigon District (photo by M. Francis).



## **Poplar borer**, *Saperda calcarata* Say

Since 2004, this borer has been recorded in Thunder Bay and Nipigon districts at low levels. The cumulative damage of the poplar borer is now being seen in these districts. It was not uncommon to see bleeding wounds, coarse sawdust or other signs of this pest, such as woodpecker damage, on single trees or groups of trees within a stand. The majority of the damage was in the central portion of Thunder Bay District and the southwest portion of Nipigon District, but low levels were detected all across the region. This insect may also be contributing to the aspen decline in Thunder Bay and Nipigon districts.

## **Redhumped caterpillar**, *Schizura concinna* (J.E. Smith)



The redhumped caterpillar was observed causing moderate damage to small roadside willow trees on the west end of Roslyn Road in the city of Thunder Bay in 2008 (Figure 4.15).

Defoliation by this pest was also recorded as a result of an extension call in the south end of the city of Thunder Bay for an unrelated incident. At this site, two apple (*Malus* spp.) trees had light-to-moderate defoliation overall; however, the actual branches with colonies of the redhumped caterpillar had severe damage.

**Figure 4.15** Redhumped caterpillar larvae in Thunder Bay District (photo by M. Francis).

### **Pine needle sheathminer**, *Zellaria haimbachi* Bsk.

While this pest is rarely a problem, it can cause noticeable defoliation of jack pine. It can also be confused with jack pine budworm (*Choristoneura pinus pinus* Free.) defoliation, with which it often co-occurs.

Its life cycle closely parallels the budworm. Like the jack pine budworm, this needle miner emerges in the spring and feeding is usually completed in late June or July. Unlike the budworm, the needle miner spins a mass of silken webbing around the base of needles which are fed on by mining the base of the needle at the sheath.

In 2008, large numbers of this needle miner were recorded west of the city of Thunder Bay in and around the municipal golf course causing light to moderate damage on jack pine trees. Mature larvae were seen hanging in the air when gusts of wind came along in July.



## FOREST DISEASES

### **Armillaria root rot**, *Armillaria* spp.

In 2008, armillaria root rot was recorded in Thunder Bay and Nipigon districts. It was commonly found on recently dead and dying trembling aspen and balsam poplar trees in Ledger Township as well as on individual trees along the Hwy. 11/17 corridor between Thunder Bay and Nipigon. The unmistakeable white mycelial fan and dark brown shoe-string rhizomorphs were noted just under the bark at the base of the host trees (Figure 4.16).

Figure 4.16 Armillaria root rot with white mycelial fan on balsam poplar, Nipigon District (photo M. Francis).

### **Spruce needle rust**, *Chrysomyxa ledicola* Lagerh. and *C. ledi* (Alb. & Schwein.) de Bary var. *ledi*

The cool wet conditions that were experienced in spring and early summer of 2008 in the region favoured proliferation of this fungus and led to a high incidence of infection by this foliar disease of spruce trees. Heavily infested trees were found in several locations throughout the Red Lake and Sioux Lookout districts.

### **Ink spot of aspen**, *Ciborinia whetzelii* (Seaver) Seaver

This foliar disease of aspen can be easily identified by the spots that form on the leaf surface, which resemble ink spots. During 2008, this disease was found to be causing up to 80% defoliation of trembling aspen in pockets of up to 1 ha in size near Big Sandy Lake, Dryden District.

## **Pine needle rust**, *Coleosporium asterum* (Dietel) Syd. & P. Syd.

Low levels of this needle rust were observed in the central part of Thunder Bay District in 2008. Pine needle rust was found on both red (*Pinus resinosa* Ait.) and jack pine trees at low levels in plantations on 25th Sideroad in Thunder Bay.

One young red pine (Figure 4.17), less than 5 years old, had high levels of this rust.

Figure 4.17 Pine needle rust on young red pine tree, Thunder Bay District (photo by M. Francis).



## **Hypoxylon canker**, *Hypoxylon mammatum* (Wahlenb.) P. Karst.

This disease is more commonly found in poorly stocked or stressed aspen stands, or on trees with branch or stem injuries. The higher incidence of poplar borer in the last few years may have created infection courts for hypoxylon canker. Incidence of this canker was recorded on trembling aspen across both Thunder Bay and Nipigon districts in 2008. Poplar borer entrance and exit holes were found in conjunction with hypoxylon canker infection on dying and dead aspen trees.

In Thunder Bay and Nipigon districts, new and old cankers were found on young and mature aspen trees in the aspen decline area. Tree snap, which is a common result of infection with this disease, was recorded in the aspen decline area and is caused by weakened stems near older cankers.

Hypoxylon canker was also recorded at lower levels in aspen stands along Goldfields Road south of Geraldton, Nipigon District.

## **Septoria leaf spot**, *Mycosphaerella populorum* G.E. Thomps.

With the wet summer weather, this leaf disease was more prevalent in 2008 than in previous years. In late August and early September, balsam poplar and trembling aspen trees exhibited the classic symptoms of septoria leaf spot in both Thunder Bay and Nipigon districts. The leaves develop many small brown spots with a dark margin which eventually coalesce into one large spot. The fungus overwinters on fallen leaves and infects new leaves in the spring.

### **Shoot blight of aspen**, *Venturia macularis* (Fr.:Fr.) E. Müll. & Arx

Young aspen trees in recent cutovers had moderate levels of shoot blight of aspen in Thunder Bay District in 2008. The typical dead leaves and hooking of the terminal shoots on aspen regeneration were found south of Dog Lake as well as in the Upsala area. Cool and damp weather experienced in the region in 2008 provided ideal conditions that may have increased the presence of this disease.

## FOREST ABIOTIC EVENTS

### Blowdown

A storm on July 12th caused 444 ha of blowdown in the central portion of Thunder Bay District in 2008. The majority of the blowdown was comprised of several small pockets that were aerially mapped at the northeast end of Lac de Mille Lac in the central portion of the district. Black spruce and aspen trees were uprooted in the direction of the storm track (Figure 4.18).

A small pocket was also mapped on the northeast arm of Dog Lake in the central portion of Thunder Bay District. The majority of the trees blown down here were mature aspen trees.

### Salt Damage

In Nipigon District, a young jack pine stand on the edge of Hwy. 11 near Lukinto Lake east of Long Lac exhibited salt damage. A stretch of approximately 2 km exhibited the classic signs of salt damage. Jack pine trees on either side of the highway displayed red foliage in the late spring. Damage was recorded up to 25 m interior of the stand edge (Figure 4.19).

**Figure 4.18** Black spruce trees blown down near Lac de Mille Lac, Thunder Bay District (photo by M. Francis).

**Figure 4.19** Jack pine damaged by salt along Highway 11 east of Long Lac, Nipigon District (photo by M. Francis).

# Northeast Region

**D. Rowlinson[1], W. Biggs[2], A.J. Keizer[2], and D. Lawrence[2]**

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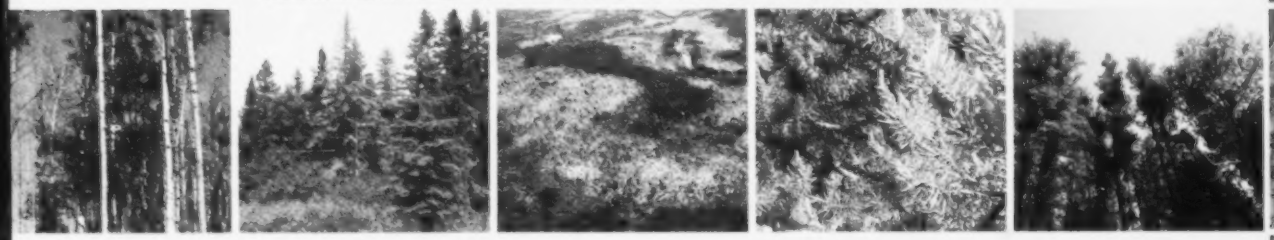


## FOREST INSECTS

### **Fall cankerworm**, *Alsophila pometaria* (Harr.)

This insect is a common pest of hardwoods in Ontario. It overwinters as an egg in bark crevices on the main stem. Eggs hatch in May and small larvae begin to feed on foliage. Mature larvae stop feeding in late June and drop to the ground where pupation occurs. Adult moths emerge in October, mate and then the wingless female climbs the tree where she deposits her eggs in bark crevices.

In 2008, this insect was recorded causing defoliation in Sudbury District, Northeast Region. High levels of this pest were found in Blezzard Valley, from the town of Val Therese to Chelmsford, Sudbury District. Scattered Manitoba maple (*Acer negundo* L.) trees were 100% defoliated.

### **Fall webworm**, *Hyphantria cunea* (Drury)

Fall webworm is a forest insect which is widely distributed throughout Ontario. The larvae hatch in mid summer, begin skeletonizing foliage and surround themselves with a web of silk which in some instances can completely cover the entire branch or tree. These webs can have larvae actively feeding in them well into September. This forest pest causes unsightly damage but seldom results in tree mortality. Nonetheless, defoliation that affects the whole tree, or occurs over several years, or occurs earlier in the growing season can result in tree dieback or mortality.

In 2008, populations across Northeast Region subsided to a low level compared to the high populations that were reported in 2006 and 2007. Single colonies were observed on individual black ash (*Fraxinus nigra* Marsh.) and white birch (*Betula papyrifera* Marsh.) trees scattered throughout Sudbury District; however, total defoliation was minor. Similarly, single colonies were noted in Carew Township north of the village of Biscotasing, Chapleau District. White birch and pin cherry (*Prunus pennsylvanica* L.f.) were the species most affected in this district.

## **Willow flea weevil**, *Isochnus rufipes* (LeC.)

The willow flea weevil feeds from June into early September. The larvae create mines which eventually coalesce and give the leaf a brown appearance. The small, 2 mm long adults also feed on the leaves, making small circular holes. Leaf browning caused by heavy infestations can make it appear the willows have been scorched by fire.

Severe leaf mining by the willow flea weevil occurred across Sudbury District in 2008. Shining willow (*Salix lucida* Muhl. spp. *lucida*) experienced 100% foliar browning throughout widely distributed areas of the district.



## **Eastern tent caterpillar**, *Malacosoma americanum* (F.)

This insect is commonly found in Ontario on cherry shrubs (*Prunus* spp.) and apple (*Malus* spp.), where it feeds as a colony and forms silken tents in branch crotches. In 2008, the eastern tent caterpillar population was prevalent across the southern portion of Northeast Region (Figure 5.1).

High populations were observed in and around the town of Espanola, Sudbury District. Populations were also high east of the city of Sault Ste. Marie, Sault Ste. Marie District where hedgerow cherry trees experienced 50-75% defoliation.

Figure 5.1 Eastern tent caterpillar nest (photo by D. Rowlinson).

## **Spiny elm caterpillar**, *Nymphalis antiopa* (L.)

The spiny elm caterpillar is the larval form of the more commonly noticed mourningcloak butterfly. The adult moth overwinters and therefore can be seen in flight on the first warm days in spring as it searches for suitable egg laying sites.

The spiny elm caterpillar was encountered commonly across Northeast Region in 2008. In Sudbury District, caterpillars were observed feeding on trembling aspen (*Populus tremuloides* Michx.), white birch and willow (*Salix* spp.) in Hutton Township and along Regional Road 84. Small populations were also noted in Timmins and Kirkland Lake districts where individual white birch were 100% defoliated.

## **Bruce spanworm**, *Operophtera bruceata* (Hulst.)

The Bruce spanworm is a very early season defoliator, which feeds on newly developing foliage (Figure 5.2). When the adult moths emerge, after the first heavy frosts in the fall, the wingless females are seldom noticed because they blend in with the bark of trees. The winged male moths however are lightly-coloured and can be observed well into November.

Sugar maple (*Acer saccharum* Marsh.) stands within the northern portions of Sault Ste. Marie District experienced moderate-to-severe defoliation by Bruce spanworm in 2008. A total of 16,486 ha of sugar maple defoliation was aerially mapped in 2008 (Figure 5.3).

The infestation was centered north of the village of Searchmont extending northwest into Grenoble Township. Overall, defoliation was moderate (30-50%), however severe defoliation (>75%) was observed on individual trees scattered throughout the infested area.

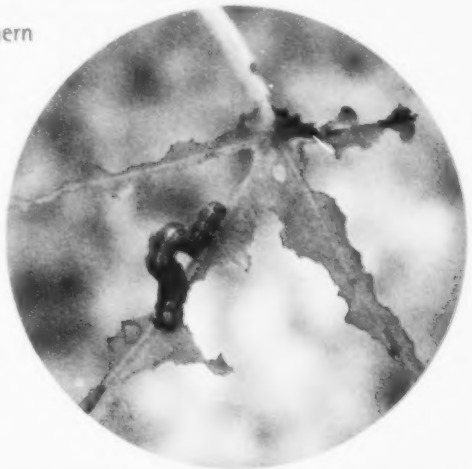


Figure 5.2 Bruce spanworm larva feeding on sugar maple (photo by H. Evans).



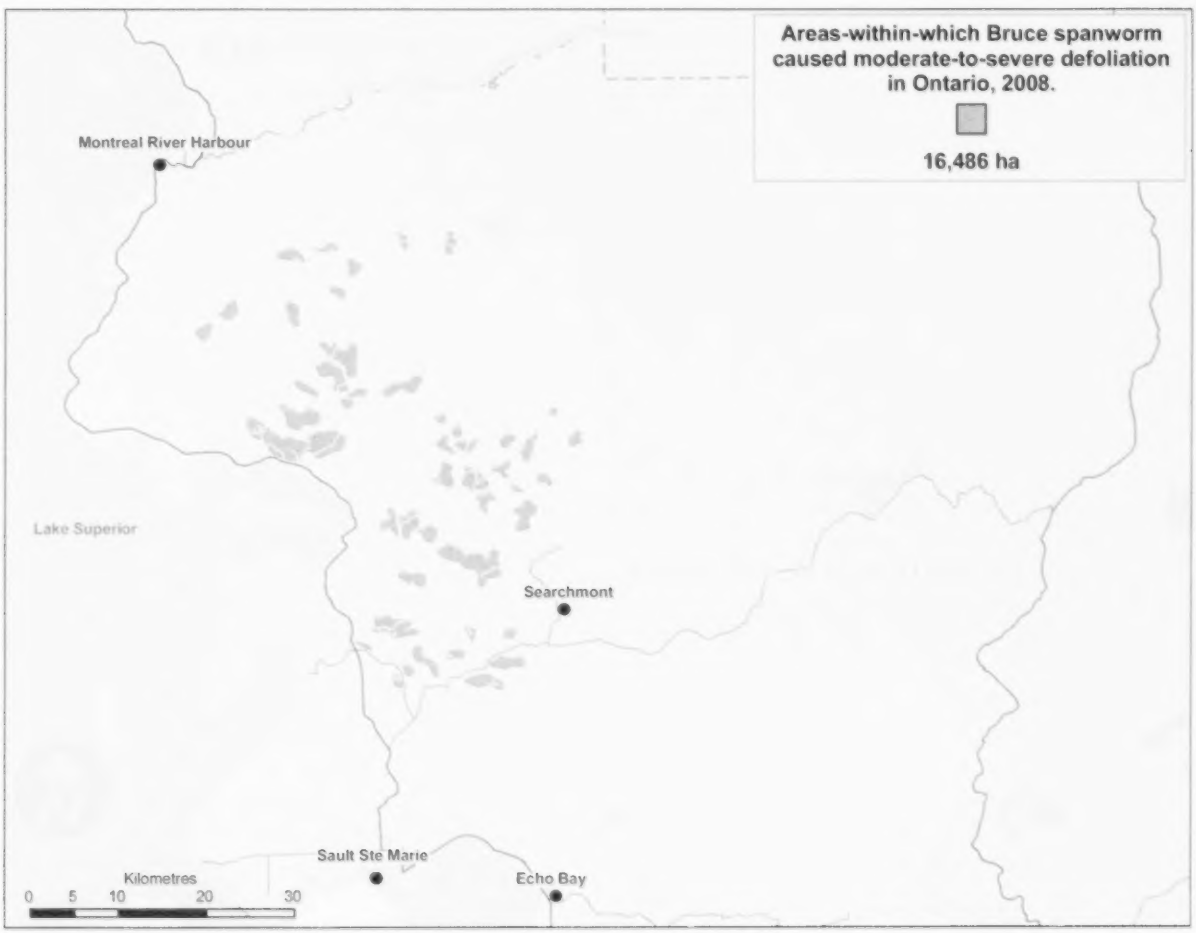



Figure 5.3 Areas-within-which Bruce spanworm caused moderate-to-severe defoliation in Ontario, 2008.

### **Yellowheaded spruce sawfly**, *Pikonema alaskensis* (Roh.)

This pest of spruce trees overwinters in the soil as a tiny larva in a dark-brown papery cocoon. In mid-June female sawflies lay their eggs in a slit made by their saw-like ovipositor along the needle's surface. Larvae emerge one to two weeks later, feed on new foliage first and then move onto old foliage. When feeding is complete in July the larvae drop to the ground to overwinter.

Populations of this sawfly were higher in the Sudbury area than those reported in 2007 (Figure 5.4). Defoliation ranged from 50-75% on ornamental and open-growing white spruce (*Picea glauca* (Moench) Voss.) trees in the district.

Figure 5.4 Yellowheaded spruce sawfly larvae (photo by D. Rowlinson).

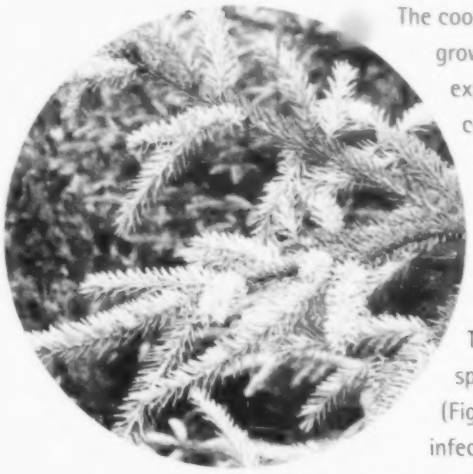


### **Aspen leafblotch miner**, *Phyllonorycter ontario* (Free.)

The aspen leaf blotch miner prefers trembling aspen and was commonly observed across Chapleau and Timmins districts in 2008. The most notable damage was observed along Kenogaming Lumber Road in Sewell Township (Timmins District), where trembling aspen had 35-40% defoliation.

## FOREST DISEASES

### **Spruce needle rust**, *Chrysomyxa ledi* (Alb. & Schwein.) de Bary var. *ledi*



The cool weather conditions and high rainfall in 2008 resulted in the growth and spread of many forest diseases. The wet weather experienced across Chapleau and Wawa districts provided optimal conditions for the spruce needle rust in 2008. As this needle rust requires the leaves of Labrador tea (*Ledum groenlandicum* Oeder) to complete its life cycle, spruce growing in close proximity to this shrub are more likely be infected. In 2008 the rust was common throughout both districts, but the most notable damage was observed along Hwy. 129 in Hutcheon Township, south of the Town of Chapleau. Here, lowland black spruce (*Picea mariana* (Mill.) BSP) exhibited 75-80% infection (Figure 5.5). Low levels of this foliar disease were also recorded infecting white spruce in Sudbury District.

Figure 5.5 Spruce needle rust on black spruce (photo by D. Rowlinson).

## **Tar spot needle cast**, *Davisomycella ampla* (Davis) Darker

Tar spot needle cast was another disease favoured by the cool wet weather of 2008. This early-season foliar disease of jack pine (*Pinus banksiana* Lamb.) was frequently observed on 2-4 m tall trees across the northern portion of Sudbury District. Some trees experienced 75% defoliation resulting from infection by this fungus.

## **Hypoxylon canker**, *Hypoxylon mammatum* (Wahlenb.) P. Karst

Hypoxylon canker is a serious problem for aspen in Northeast Region as stem infections and subsequent girdling by this fungus lead to tree mortality.

This stem disease of trembling aspen was prevalent across Northeast Region in 2008. Symptomatic discoloration of the bark, leading to eventual tree girdling was observed in Dryden Township, Sudbury District. Infections were also noted in Wawa District north of the town of White River where individual 6-10 m tall trees along the Hwy. 631 in Tedder Township were affected.



## **Septoria leaf spot**, *Septoria betulae* Pass.

In August, foliage of white birch began to prematurely change from green to yellow (Figure 5.6). Septoria leaf spot was the cause, with infection levels varying from 5-25%. This damage was common throughout the Sudbury basin within a boundary of Naughton in the west and extending to the small town of Chelmsford. Other infections were observed around Lake Wanapitae, extending north into the town of Capreol. Similarly, septoria damage on white birch was observed along Island Lake Road, southeast of the town of Chapleau, Chapleau District, where infections levels varied from 10-45%.

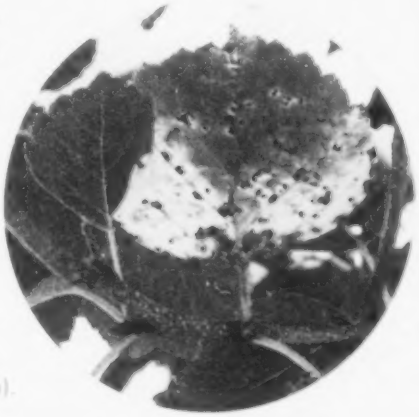


Figure 5.6 Septoria leaf spot on white birch (photo by D. Rowlinson).

## **Shoot blight**, *Venturia macularis* (Fr.:Fr.) E. Müll & Arx

This is mainly a disease affecting the terminal shoots of young, regenerating trembling aspen. Evidence of this disease was observed in Chappise Township, Chapleau District. At this location 60-75% of the 1-2 m tall aspen trees were affected (Figure 5.7).

Aspen at many locations along roadways and in abandoned farm fields located throughout Sudbury District were also recorded as being infected with this shoot blight disease in 2008.

Figure 5.7 Shoot blight of aspen (photo by D. Rowlinson).

# Southern Region

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SECTION 6

## FOREST INSECTS

### Bronze birch borer, *Agrilus anxius* (Gory)

This pest of birch (*Betula* spp.) has persisted in Kemptville District for the past four years. Tunneling under the bark by this insect causes mortality of the host tree that typically starts at the top of the crown and proceeds downwards.

Large areas of dying birch are now quite common in the area from Lanark County east to the Quebec border and from the Ottawa River in the north to the St. Lawrence River in the south.

This insect has greatly impacted grey birch (*B. populifolia* Marsh.) throughout the range of this host species. In 2008 large areas of mortality extended from Casselman to Hawksbury, Kemptville District.

Elsewhere in Southern Region, both young and mature white birches (*Betula papyrifera* Marsh.) were under various levels of attack by this insect in both forested and urban situations.

### Metallic wood-boring beetle, *Agrilus carpini* Knull

Previously thought to be a subspecies of two-lined chestnut borer (*Agrilus bilineatus* [Weber]), *A. carpini* Knull has also been named *A. bilineatus carpini* Knull. Recent reviews of the genus now consider *A. carpini* and *A. bilineatus* to be two separate species.

The grey-coloured two-lined chestnut borer is a pest of oaks, and has two distinct stripes along the hard wings (elytra) that cover the abdomen. *A. carpini* is smaller in size, narrower in shape, and attacks blue-beech (synonym: hornbeam) (*Carpinus caroliniana* Walt.) and ironwood (*Ostrya* spp.). It lacks the distinct yellow lines along its elytra, is more metallic in appearance, and is distinctly steel blue to royal blue in colour.

In Ohio, *A. carpini* has been reported to attack blue-beech, especially when stressed or after transplanting. The columnar upright varieties seem to be preferred.

Figure 6.1 Metallic wood-borer damage to columnar blue beech in the city of Windsor, Aylmer District in 2008 (photo by E. Czerwinski).

Several years of drought conditions in southwestern Ontario predisposed ornamental columnar blue beech to attack by this buprestid beetle causing significant tree mortality (35%) in the city of Windsor, Essex County, Aylmer District (Figure 6.1). This 2008 record is the first detection of the insect causing damage in Ontario. Less severe attack occurred to many host trees in planted areas and resulted in trees with chlorotic foliage and some branch dieback. The full effects of this insect outbreak will be more evident in the next few years.

## **Fall cankerworm**, *Alsophila pometaria* (Harr.)

This potentially serious pest was found for the second consecutive year at several locations within Aurora District in 2008. In Ontario this looper is commonly found on Manitoba maple (*Acer negundo* L.) but generally host species include more valuable hardwoods. In 2008, the most severely damaged host was red oak (*Quercus rubra* L.). Other hosts included: bitternut hickory (*Carya cordiformis* [Wangenh.] K. Koch), white birch, basswood (*Tilia americana* L.), ash (*Fraxinus* spp.), soft maple (*Acer* spp.), trembling aspen (*Populus tremuloides* Michx.) and sugar maple (*Acer saccharum* Marsh.).

Severe defoliation occurred on more valuable hardwoods in the Campbellville area in the town of Milton and in the city of Burlington both in Halton Region, Aurora District. There were several pockets of defoliation both north and south of Hwy. 401, with most areas located on top of the Niagara Escarpment. Many of the woodlands infested occurred on Halton Region Conservation Authority property and surrounding areas at Hilton Falls, Kelso, Rattlesnake Point and Mount Nemo conservation areas. The total mapped area of moderate-to-severe defoliation was 723 ha (Figure 6.2).

Areas where Manitoba maple was the sole host were located in Oshawa, Woodbridge, and Brampton as well as in the village of Campbellville, Aurora District, and at points near Ancaster and Brantford, Guelph District.

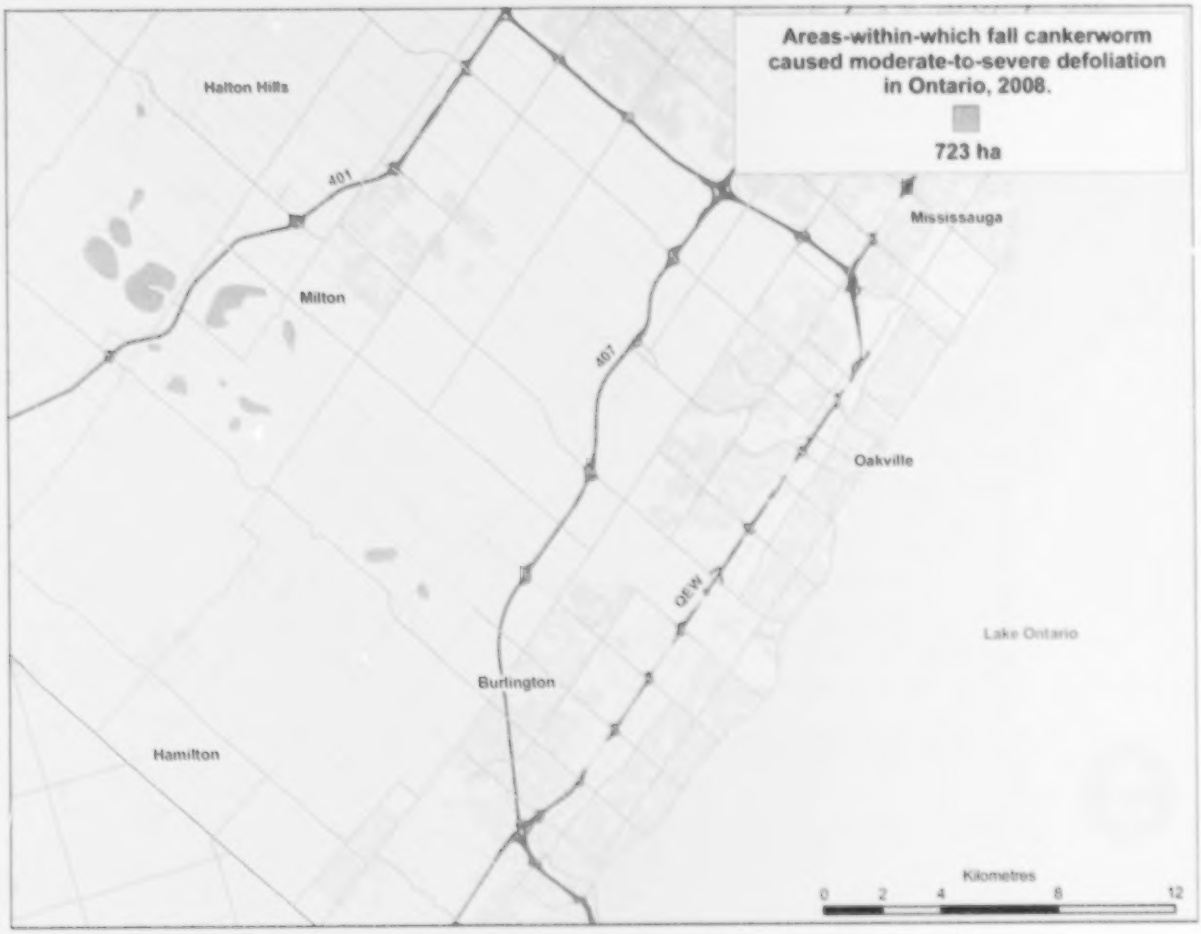



Figure 6.2 Areas-within-which fall cankerworm caused moderate-to-severe defoliation in 2008.

## **Orangestriped oakworm**, *Anisota senatoria* (J.E. Smith)

The caterpillar of the orangestriped oakworm has a prominent pair of "horns" behind the thoracic shield which distinguishes it from other oakworms. Young larvae initially feed in groups, but separate as they mature and will eat entire leaves except the main vein.

The orangestriped oakworm caused moderate defoliation on oak (*Quercus* spp.) at Pinery Provincial Park, Aylmer District. Defoliation averaged 30% on the host.

## **Pine spittlebug**, *Aphrophora cribrata* (Wlk.)

High populations of this pest continue to plague Scots pine (*Pinus sylvestris* L.), jack pine (*P. banksiana* Lamb.) and eastern white pine (*P. strobus* L.) throughout Pembroke and Kemptville districts. In 2008, some tip mortality (2-5%) was recorded on small 2-4 m tall trees in eastern white pine stands in Limerick Forest and on 4 m tall trees at Oxford Mills, Kemptville District.

## **Hickory twig pruner**, *Anelaphus parallelus* (Newm.)

High population levels of this insect were recorded across the eastern portion of the region in 2008. Up to 25% damage in the form of snapped branches (<1 m in length) was recorded within the crown of affected oak trees in Peterborough, Bancroft, Kemptville and Pembroke districts. In Peterborough and Kemptville districts the damage was prevalent along Hwy. 7 into the Lanark and Almonte areas. In Bancroft District, damage was mostly encountered near Bon Echo Provincial Park, Hwy. 41, while in Pembroke District light damage (10%) occurred on open-grown trees along Hwy. 17 between Arnprior and Pembroke.

## **Cedar leafminer complex**, *Argyresthia* spp.

The overall area damaged by cedar leafminers in Southern Region declined significantly in 2008 to only 148 ha from 29,986 ha of moderate-to-severe defoliation recorded in 2007.

In 2008, cedar leafminer populations increased in the Owen Sound area of Midhurst District. Noticeable defoliation occurred in Grey County, in the town of Meaford and nearby in Chatsworth Township. The leafminers here were identified as cedar leafminer, (*Argyresthia aureoargentella* Brower) and arborvitae leafminer (*A. thuiella* [Pack.]). This area totalled 148 ha (Figure 6.3).

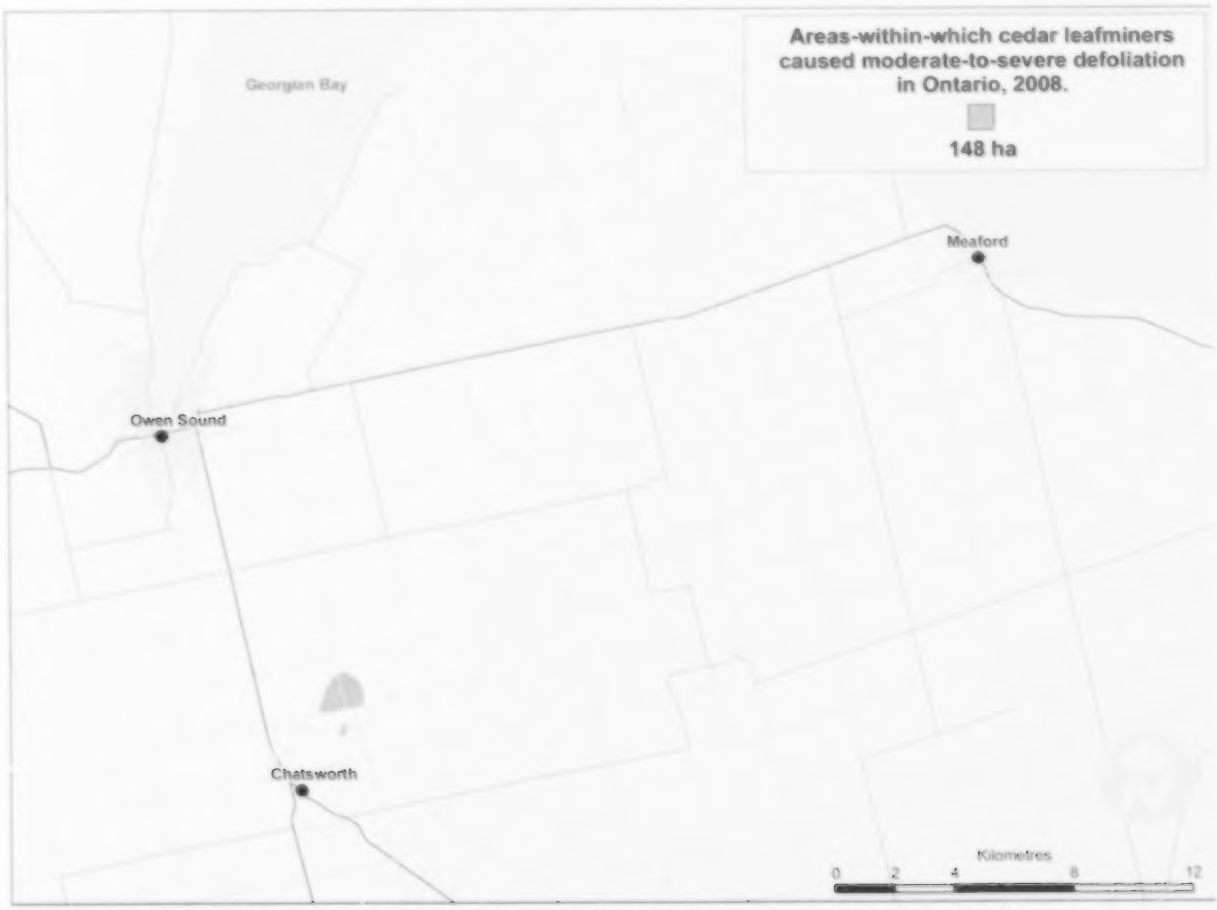



Figure 6.3 Area-within-which cedar leafminers caused moderate-to-severe defoliation in Ontario in 2008.

Similar damage was also observed on the Bruce Peninsula from the Mar area of South Bruce Peninsula Township north to the Ferndale area of Northern Bruce Peninsula Township. Here the leafminers were identified as arborvitae leafminer and the brown cedar leafminer (*Coleotechnites thujaella* [Kft.]).

This year, only light damage could be attributable to the cedar leafminer complex in Kemptville District. The area extended from Kemptville southeast to McCarleys Corners then southwest into the Cranberry Lake area; through Nolands Corners and then north to Dwyer Hill and Pierces Corners. Large pockets of dead tops and whole tree mortality were present through the limestone exposed sites. Light damage was also recorded near Foresters Falls along the Ottawa River, Pembroke District. Similarly, light damage was observed near Kiosk and Brent areas, Algonquin Park.

In 2007, moderate-to-severe damage had occurred on eastern white cedar (*Thuja occidentalis* L.) south of Ottawa, Kemptville District. In these locations, the several consecutive years of damage resulted in considerable top mortality and some whole tree mortality in 2008.



## **Basswood leafminer**, *Baliosus nervosus* (Panz.)

The adult basswood leafminer feeds on basswood early in the year by skeletonizing young leaf tissue as it unfolds from the bud. Developing larvae mine within the leaf surfaces, leaving a brown blotchy effect on the leaf. The combined effect of adult and larval feeding, when populations are high, can cause trees to appear quite brown. Pupation will occur within the mined-out portion of the leaf, adults emerge and then feed again by skeletonizing any green-coloured basswood foliage.

For the third consecutive year, basswood leafminer populations remained in the same general areas as reported since 2006. This leafminer has now been recorded for several years in the central part of Midhurst District and in scattered locations throughout Dufferin, Grey and Bruce counties. Moderate-to-severe defoliation was also recorded near Bayfield in Huron County, Guelph District.

Throughout Southern Region, defoliation was heaviest on regeneration and in the lower crowns of larger trees, but was not as severe as in the past couple of years. At some locations the progression of attack reached close to the tops of the upper crown where premature defoliation was evident.

## **Oak defoliator complex: oak leafshredder** *Croesia semipurpurana* (Kft.) and **obliquedbanded leafroller**, *Choristoneura rosaceana* (Harr.)

For the third consecutive year, a complex of insects including the oak leafshredder, the obliquedbanded leafroller and other leaf feeders caused defoliation to red oak in the Pembroke area. In 2007, the infestation occurred on rocky hilltops in the Barron River area, town of Laurentian Hills. The total area affected in 2007 was 225 ha. In 2008, low populations caused light (10-20%) defoliation on red oak at several locations in Petawawa, McKay, Wylie, Stratton, and Bronson townships, Pembroke District.

## **Pine needleminer**, *Exoteleia pinifoliella* (Cham.)

The pine needleminer feeds as a tiny larva in the interior of current year's needles of jack pine (*Pinus banksiana* Lamb.). Damaged foliage eventually turns brown.

Noteworthy damage was first detected in 2005. Severe damage was again observed in 2008 in the Township of the Archipelago, Wallbridge Twp, and Magnetawan IR#1 where stands of jack pine were 75% to 100% brown.

## **Cherry scallopshell moth**, *Hydria prunivorata* (Fgn.)

Figure 6.4 Damage to black cherry by the cherry scallopshell moth (photo by E. Czerwinski).

For the first time since 1970-1972, this insect caused severe damage to black cherry (*Prunus serotina* Ehrh.) trees in Southern Region (Figure 6.4). In 2008, at three widely separated points in the Aylmer District black cherry was severely defoliated by this looper.

Aerial reconnaissance disclosed damage in the form of leaf folding, skeletonizing and severe foliar browning in woodlots from Thamesville, Chatham-Kent County; Vienna, Bayham Township, Elgin County; to Bachus Woods, South Walsingham Township, Norfolk County. The combined area infested totaled 224 ha (Figure 6.5).

## **Fall webworm**, *Hyphantria cunea* (Drury)

Population levels of the fall webworm have been high for three consecutive years and 2008 was no different.

Complete defoliation of host trees was observed at several locations; near Barrie in Springwater Township, Midhurst District; in several areas of Aurora District including locations in Scugog Township; pockets in the Palgrave area of Caledon; and on trees along the Holland River north of Holland Landing.

In Aylmer District, numerous locations had fall webworm defoliation and tents, especially along the lower Thames River west of London and at Pinery Provincial Park on black cherry.

An increase in this insect's population was observed across Peterborough, Bancroft, Kemptville and Pembroke districts in 2008. Heaviest colonization occurred in the hardwood

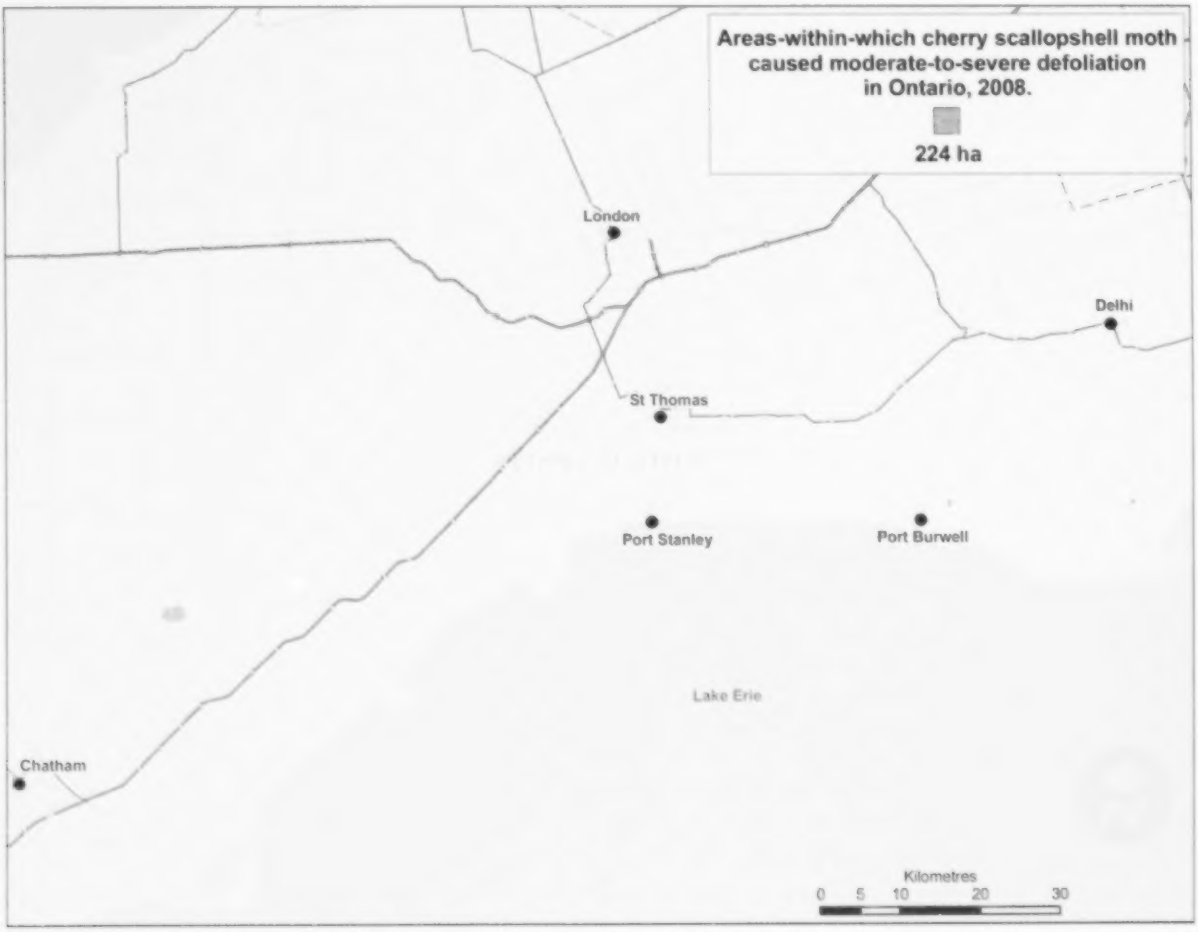



Figure 6.5 Areas-within-which cherry scallopshell moth caused moderate-to-severe defoliation in Ontario, 2008.

swamps (of mostly ash) from Richmond to Carleton Place, Kemptville District, and along Hwy. 17 between Arnprior and Pembroke, Pembroke District.

In Parry Sound District, population levels of fall webworm subsided somewhat in 2007 and continued to decrease in 2008. Low numbers of tents were observed throughout Parry Sound District, with often only one or two tents per tree.

## Northern engraver, *Ips borealis* Sw.

The northern engraver, a serious pest of spruce (*Picea* spp.) trees throughout Southern Region, was recorded in Peterborough District in 2008. Major weather events, such as windstorms and prolonged drought conditions cause varying stress levels on trees which attract opportunistic bark beetles such as the northern engraver.

In the Kingston area, high populations were noted west of the airport infesting mature white spruce trees (*P. glauca* [Moench] Voss) resulting in some tree mortality.

## **Eastern tent caterpillar**, *Malacosoma americanum* (F.)

This caterpillar is often found along roadsides, along forest edges and on understory forest shrubs feeding on a variety of cherry (*Prunus* spp.) species. Population levels fluctuate from year to year with occasional outbreaks.

For the second consecutive year, high populations caused severe defoliation across Southern Region. Populations were most evident in Midhurst, Aurora, Peterborough and Bancroft districts, but were rarer in Parry Sound and Kemptville districts.

## **Basswood thrips**, *Neahydatothrips (Sericothrips) tiliae* Hood

There are two species of thrips which feed on basswood, the introduced basswood thrip (*Thrips calcaratus* Uzel), a species of concern, and a native basswood thrip (*Neahydatothrips (*Sericothrips*) tiliae* Hood), that can be found on foliage later in the summer, and may contribute to overall damage. The larvae appear in mid-to-late May, and feed on leaf tissue throughout their development. Fully-developed larvae drop from the foliage, move into the litter and soil, and pupate. Adults emerge from pupae later in the summer, move into the soil, and go into diapause until the following spring.

Damage to host trees by thrips is characterized by bud drop in the early spring or stunted, shredded appearance of leaves. On fully-developed leaves, feeding damage appears as a browning of the leaf margin. Repeated damage may lead to thinned crowns, branch dieback, and eventual reduction in radial growth

For the fifth consecutive year, foliar damage by *Neahydatothrips (Sericothrips) tiliae* ranged from 40-75% on basswood, through most of Peterborough District and in 2008 extended north into the southeastern portion of Bancroft District.

For the second consecutive year, high populations recurred in the Bolton area, Peel Region, and near Milton, both in Aurora District.

## **Balsam fir sawfly**, *Neodiprion abietis* (Harr.)

High populations caused 100% defoliation to old foliage of 16 m tall balsam fir (*Abies balsamea* L.) trees along Killarney Bay Road, city of Kawartha Lakes and 25-40% foliar damage was recorded sporadically to the east of Frontenac Road, Central Frontenac Township, both located in Peterborough District.

## **Redheaded pine sawfly**, *Neodiprion lecontei* (Fitch)

Populations of the redheaded pine sawfly continued to expand in the central and eastern parts of Southern Region in 2008.

High populations caused 70% defoliation on 92% of 2.7 m tall red pine (*Pinus resinosa* Ait.) trees. Damage ranged from 5-100% in the 5 ha plantation in Lennox and Hastings Twp, Peterborough District.

In Bancroft District entire trees up to 5 m tall were stripped of their foliage at several locations near Haliburton, Billings Lake, Dysart, Dudley, Harcourt, Guilford, Harburn, Bruton, Havelock, Eyre and Clyde Township. Increasing numbers of redheaded pine sawfly were also recorded for the second consecutive year in Bancroft Distrct on mature shoreline red pine trees near Mazinaw Lake, Addington Highlands,

In Kemptville and Pembroke districts the most severe damage was encountered on young 0.5 m tall red pine trees in a 4 ha plantation near East Oxford, North Grenville Township, Kemptville District. At this location, 30% of the trees had on average 20% total defoliation.

In Midhurst District redheaded pine sawfly was also recorded on red pine regeneration plantings at Canadian Forces Base Borden.

## **Maple leafcutter**, *Paraclemensia acerifoliella* (Fitch)

Over the past few years, population levels of this insect have fluctuated in Peterborough and Bancroft districts, with forested areas sustaining up to 5,549 ha of damage (2005). In 2006, a population crash occurred and infestations were restricted to a few locations within Bancroft District.

In 2008, only low populations of the maple leafcutter occurred on understory sugar maple, causing light defoliation (10-25%) in Effingham Township, Bancroft District and at Murphy's Point Provincial Park, Kemptville District.

## **Northern cedar bark beetle**, *Phloeosinus canadensis* Swaine

The only bark beetle known to attack cedar, this insect infests weakened or dying trees. Small, minute holes in the bark and fine rust-coloured boring dust may indicate the presence of this pest. When populations are high, the adult beetles will feed on the twigs and leaves of healthy trees causing foliage to turn brown.

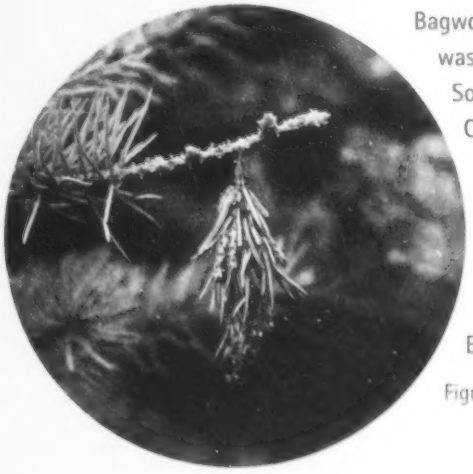
Ten infested trees were reported as dead along a windbreak planting near Hamilton, Mount Hope, Guelph District.

## **Larch sawfly**, *Pristiphora erichsonii* (Htg.)

Large populations of this insect can completely defoliate and severely damage host trees, by causing branch or whole tree mortality. Mortality often follows attack by secondary pests, such as the eastern larch beetle (*Dendroctonus simplex* LeC.), which are attracted to the weakened tree.

In 2008, the larch sawfly caused 80% defoliation on tamarack (*Larix laricina* (Du Roi) K. Koch) trees <10 m tall near Maynooth, South Algonquin Township, Bancroft District. It was also responsible for moderate-to-severe defoliation in a small area along Guelph Line, Halton Region, Aurora District.

### **Bagworm**, *Thyridopteryx ephemeraeformis* (Haw.)



Bagworm is an insect that is rarely encountered, but in 2008 it was collected on six different tree species in the city of Windsor, Southern Region (Figure 6.6). Host species infested included Colorado blue spruce (*Picea pungens* Engelm.), Norway maple (*Acer platanoides* L.), English oak (*Quercus robur* L.), honey locust (*Gleditsia triacanthos* L.), cherry, and eastern red cedar (*Juniperus virginiana* L.) which were all ornamentals or urban street trees. Damage ranged from 40-100% along Riverside Drive, and from the International Bridge to E.C.Row Expressway along Huron Church Blvd.

Figure 6.6 Bagworm infesting blue spruce (photo by E. Czerwinski).



## FOREST DISEASES

### **Sycamore anthracnose**, *Apiognomonia veneta* (Sacc. & Speg.) Höhn.

Anthracnose is mainly found on maple and oak, but is occasionally found on ash, beech and sycamore (*Platanus occidentalis* L.). Irregular areas of dead tissues on host leaves are seen with the presence of this disease. Heavily infected leaves will prematurely drop to the ground. Twig and branch dieback is possible after repeated infections.

In 2008 infection by this disease caused high levels of leaf drop resulting in severe defoliation of sycamore trees in the Fonthill area of Niagara Region, Guelph District.

### **Ash anthracnose**, *Discula fraxinea* (Peck) Redlin & Stack, and *Apiognomonia errabunda* (Roberge) Höhn.

Ash anthracnose was widely recorded throughout Southern Region for the second consecutive year.

The disease was recorded on scattered trees through Aurora, Midhurst, Peterborough, Kemptville and Pembroke districts with no apparent pattern of distribution. In late May and early June, just after leaf flush, trees began to display symptoms of attack. In most instances

the heaviest damage was confined to the lower and mid-crown of the affected trees. Damage was especially severe on understory ash occurring in West Grey Township, Midhurst District.

## **Fomes root rot**, *Heterobasidion annosum* (Fr.:Fr.) Bref.

This destructive pathogen has been quite active in established red pine plantations through Limerick and La Rose forests, Kemptville District. Mortality rates within the pockets of infection in those areas annually average 1-2% for the past several years. Fruiting bodies of this fungus were quite evident in 2008 and were found on living trees at both locations. In the same area, spruce (*Picea* spp.) and pine (*Pinus* spp.) regeneration were affected in the understory.

## **Linospora leaf blight**, *Linospora tetraspora* G.E. Thomps.

Balsam poplar (*Populus balsamifera* L.) trees in the eastern portion of Southern Region sustained severe infection from this leaf blight.

In Peterborough District, 85% foliar damage resulted from leaf infections and in Pembroke and Kemptville districts, trees were devoid of leaves by the end of August as a result of infection from this blight.

## **Larch-poplar rust**, *Melampsora medusae* Thüem.

Like most rusts, this fungus needs two different hosts to complete its life cycle. The main host is poplar and the alternate host is larch. Damage is insignificant on larch but can be serious on poplar. Yellow to orange pustules can be found on the underside of poplar leaves during the summer months.

This pathogen was quite active in balsam poplar stands through Peterborough District in 2008. Foliar damage was recorded at 100% at many locations across the district.

## **Septoria leaf spot**, *Mycosphaerella populorum* G.E. Thomps.

This foliar disease was recorded on largetooth aspen (*Populus grandidentata* Michx.) and balsam poplar and was more widely distributed than the larch-poplar rust in 2008.

Clonal stands of these poplar species had infection levels ranging from 25% to 75%, while others were completely stripped of foliage in late August through Parry Sound, Bancroft, Pembroke and Kemptville districts.

### **Septoria leaf spot**, *Septoria betulae* Pass.

The high amounts of precipitation during June, July and August contributed to leaf spot becoming abundant and widespread in Southern Region in 2008. Infection levels on white birch ranged from 5-25% early in the season and progressed to 40-100% of the foliage, by late summer. The foliar disease was prevalent in Parry Sound, Bancroft, Peterborough, Pembroke and Kemptville districts.

## FOREST ABIOTIC EVENTS

### Frost Damage

Late spring overnight frosts caused considerable damage to the young succulent developing foliage of deciduous trees in 2008. The level of damage ranged from partial defoliation to 100% defoliation, depending upon exposure or how high up the tree frost occurred. Areas of damage were recorded at several locations widespread throughout Aurora, Midhurst and Peterborough districts.

The most commonly affected host species were ash and oak. Samaras of soft maples were also affected. The damaged trees re-foliated so quickly that a full delineation survey of the damage was not feasible.

### Hail Damage

Three small areas of hail damage were aerially detected south and southeast of King City, in an area bordering King Township and the city of Vaughan, York Region, Aurora District. All species of trees were affected but poplar (*Populus* spp.) and birch displayed the most obvious signs of damage. Total area affected was 67 ha (Figure 6.7).

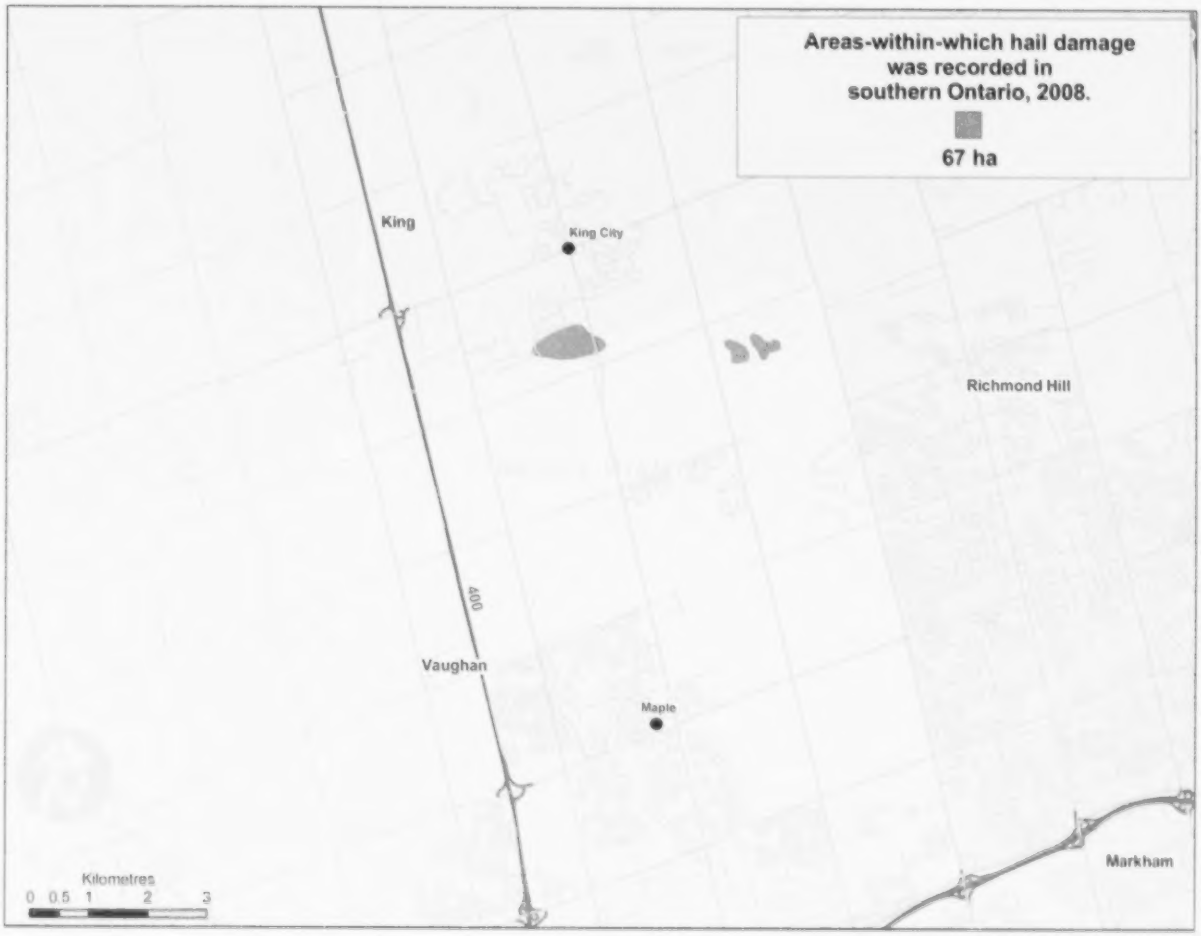



Figure 6.7 Areas-within-which hail damage was recorded in southern Ontario, 2008.

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ISSN 1913-6164 (print)
ISBN 978-1-4249-8777-1 (2008 ed., print)

ISSN 1913-617X (online)
ISBN 978-1-4249-8777-8 (2008 ed., pdf)

Printed on
recycled paper.